

THE MOUNTAIN WORLD

PUBLISHED BY THE SWISS FOUNDATION FOR ALPINE RESEARCH

ARNOLD LUNN: *Geoffrey Winthrop Young* - BRADFORD WASHBURN: *Aerial photography Alaska and the Alps*
W. ABALAKOV AND W. KIZEL: *Pobeda Peak* - TOM W. PATEY: *Rakaposhi* - FRANZ MANDL: *Haramosh*
ROBERT L. SWIFT: *Hidden Peak (Gasherbrum I)* - FOSCO MARAINI: *Gasherbrum IV* - JOHN EDWARDS: *Batura Mustagh*
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THE MOUNTAIN WORLD
1960/61

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English version edited by Malcolm Barnes

The Mountain World series has been acclaimed all over the English-speaking world for the fascination of its contents and the excellence of its production. The 1961 edition is the equal of its forerunners in every respect: the variety of its stories of recent mountaineering and exploration is matched by the number and beauty of the illustrations, and the contributors come in equal parts from Britain, America and the continent of Europe. One long paper by Herfried Hoinkes of Austria describes a year in Antarctica during the International Geophysical Year, with special reference to the mountain ranges of the frozen continent. There is a paper by two Soviet mountaineers on an expedition into the highest part of the Pamirs; a paper on the Swiss Alpine Club Andean expedition; a Swiss account of botanical experiences in the Arctic regions of Canada; a moving story of the tragic Batura-Mustagh expedition by one of its few survivors, John Edwards; and, apart from other adventures, and a contribution on the Abominable Snowman, there is a very remarkable study of Geoffrey Winthrop Young by Arnold Lunn. Finally there is the Mount McKinley map, one of the finest examples of cartographic work by Wild Heerbrugg and the Swiss Federal Institute of Topography.

In spite of the increased price, *The Mountain World* is still a bargain, for no effort or expense has been spared by its Swiss producers to maintain the traditional standards.

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SWISS FOUNDATION FOR ALPINE RESEARCH

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1960/61

ENGLISH VERSION EDITED BY
MALCOLM BARNES

RAND McNALLY & COMPANY
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DIRECTED BY HANS RICHARD MÜLLER AND MARCEL KURZ
ON BEHALF OF THE SWISS FOUNDATION FOR ALPINE RESEARCH, ZÜRICH

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CONTENTS

Preface	V
Geoffrey Winthrop Young. By Arnold Lunn	1
Aerial Photography: Alaska and the Alps. By Bradford Washburn	19
Pobeda Peak. By W. Abalakov and W. Kizel	23
Rakaposhi. British-Pakistani Forces Expedition 1958. By Tom W. Patey	32
Haramosh. Austrian Himalaya-Karakoram Expedition 1958. By Franz Mandl	42
Hidden Peak (Gasherbrum I). American Expedition 1958. By Robert L. Swift	61
Gasherbrum IV. Italian Karakoram Expedition 1958. By Fosco Maraini.....	72
Batura Mustagh Expedition 1959. By John Edwards	87
German Karakoram Expedition 1959. By Hans-Jochen Schneider	108
Austrian Dhaulagiri Expedition 1959. By Fritz Moravec	126
Swiss Dhaulagiri Expedition 1960. By Max Eiselin and Ernst Forrer.....	131
Unknown Mountain: The Ascent of Trivor. By Wilfrid Noyce	141
Ruwenzori. By Dölf Reist.....	157
Swiss Alpine Club Andean Expedition 1959. By Ruedi Schatz	163
The Antarctic during the International Geophysical Year, with a supplement on Mountains and First Mountaineers in Antarctica. By Herfried Hoinkes.....	179
The Commonwealth Trans-Antarctic Expedition 1955-58. By George Lowe	237
Spring in the Arctic Mountains (Baffinland, Canada). By F.H. Schwarzenbach.....	244
The Yeti: Biped or Quadraped? By Ed. Wyss-Dunant	252
The Map of Mount McKinley. By Bradford Washburn.....	260

MAPS AND SKETCHES

Rakaposhi	37
Haramosh Range	57
Haramosh.....	58
Baltoro Region	71
West Gasherbrums Group	76
Gasherbrum IV from West	82
Gasherbrum IV from South-East	84
Northwest Karakoram.....	near p. 120
Mount Trivor and Surroundings	146
Cordillera Vilcabamba (Andes)	174
Antarctica IGY 1957-58, IGC 1959	near p. 200
Mount McKinley 1:50,000	(enclosure)

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PREFACE

The chronicle of important expeditions with first ascents of peaks outside the Alps and exploration of polar regions which, in the form of authentic reports, is presented in *The Mountain World* series, covers in the present volume the period from 1958 to the summer of 1960.

The reports on the ascents of the last two accessible peaks higher than 8000 metres (26,247 feet), *Hidden Peak* (Gasherbrum I) and *Dhaulagiri*, represent the end of an era in the history of *Himalayan* mountaineering. Of the fourteen "eight-thousanders" only one is still unclimbed, the 8013 metre high Gosainthan, but this lies north of the Nepalese frontier ridge completely in the now inaccessible territory of Tibet. Apart from these celebrated giants there are numerous unclimbed subsidiary summits, some of them named, which also project above the 8000 metre level, to say nothing of the host of six-thousanders and seven-thousanders still to be conquered; these will provide wide scope for mountaineering and scientific expeditions for decades to come. What, after all, is the essential difference between a "high" seven-thousander and a "low" eight-thousander? It is only man with his classifying habit and peculiar methods of judging mountaineering achievements who makes such distinctions, not nature.

New lessons concerning the use of aircraft and its advantages and disadvantages were learnt by the Dhaulagiri expedition. This thoroughly modern technical aid for surveying lengthy approach routes will no doubt be increasingly used in the future.

In the *Andes* too the era of first ascents of the highest mountains is nearing its close. Quite apart from any question of record-breaking for its own sake, the 1959 Andes expedition of the Swiss Alpine Club was a pleasant reminder that there is still a good deal of territory here to be discovered and many important summits to be conquered.

As a result of the research work carried out during the *International Geophysical Year* the newly opened up continent of the *Antarctic* is now definable in its broad outlines. A mass of ice of fantastic dimensions covers this newest continent, from which a number of mountain ranges project far above the 4000 metres level. This entire region is, so to speak, virgin territory, every expedition here blazes a new trail! Mother Earth has not yet completely revealed her face to man; she still offers limitless scope for the human craving for adventure and probing the unknown.

In future the books in this series, which are published every two years, will be issued in the late summer. This decision has been taken in response to suggestions from our associated publishers, who have for years actively assisted with the distribution of these books.

Shortly before the completion of the previous volume there occurred the death of *Othmar Gurtner*, who had edited the series for many years and under whose guidance they had acquired a sharply defined character. As his successor it will be my aim to carry on the work in the same way, with the assistance of the extensive Alpine experience of our colleague of many years' standing, Marcel Kurz.

Zurich, Summer 1961

Hans Richard Müller

1 overleaf, top: GEOFFREY WINTHROP YOUNG at the age of nineteen (1895).
bottom: G. W. YOUNG at the age of fifty-two (1928).



GEOFFREY WINTHROP YOUNG

By Arnold Lunn

Geoffrey Winthrop Young was one of those mountaineers who are tacitly accepted as the most representative climbers of a particular epoch. His relationship to the last decade before the First World War was much the same as that of Whymper to the Golden Age and Mummery to the Silver Age of mountaineering, and as, in the case of both Whymper and Mummery, his fame owes as much to his books as to his climbs. Young was born on October 25th, 1876 and died September 8th, 1958. He was the second son of Sir George Young, Bt. Sir George, who was one of the pioneers of the Alps and was the first to climb the Jungfrau from the Scheidegg, lost a brother on the descent from the summit of Mont Blanc. Sir George, as the leader of this guideless party, felt responsible for his brother's death and never climbed again. I had been warned before I first met him never to mention mountains in his presence and the solitary reference of his to mountains that I recall was just after Young and I had returned from a search party in the Pyrenees. Hugh Pope, perhaps the most brilliant of the younger mountaineers, had been killed in the course of a solitary ascent of the Pic du Midi d'Ossau. After dinner, Sir George took me aside and asked me how the accident had happened, and I felt that he was reliving his own tragedy. I summed up in a few words what little we knew about the tragedy. He sighed deeply and rejoined the other guests.

Sir George was, I think, a disappointed man. He had hoped for a political career but his attempts to enter Parliament as a Liberal had ended in failure. He was rather unapproachable and seemed to me to have few contacts with the clever and entertaining people whom Geoffrey Young brought down to "Formosa" weekend after weekend. In this as in other respects he was a complete contrast to his wife. Lady Young was exceptional not only for the brilliance of her mind but also for a beauty which the years seemed to mature rather than to erode. Nobody could resist her charm. The astringent wit with which she commented on human frailties was redeemed from unkindness by a discerning sympathy. Nobody who was in trouble appealed to her in vain.

Geoffrey Young was educated at Marlborough and Trinity College, Cambridge where he was awarded the Chancellor's Medal for English verse. In 1900 he became an assistant master at Eton and after five years accepted a post as inspector of Secondary Schools. He was 38 when the First World War began and, too old to begin a military career as an infantry subaltern, he served first with the Friends' Ambulance Unit in Flanders, and later in command of the First British Ambulance for Italy. He was mentioned in British Despatches and awarded the Belgian Order of Leopold for exceptional courage and recourse, and the Italian silver medal "for Valour". In 1917 he was severely wounded and his leg had to be amputated above the knee.

Young described his war experiences in a memorable book, *The Grace of Forgetting*. His problem was to prevent his irregular unit being sent home for, at first, the Army resented any unit which was not directly under military command. In a war in which the front line casualties were exceptionally heavy Young's difficulties were aggravated by the fact that Army authorities began with a strong prejudice against a unit which included many young men of military age, a unit which, though often under fire, did not in point of fact suffer a fatal casualty while Young was in command. Some of them were later killed in Italy. Young's friendship at high Army levels, his own reputation as an exceptional courageous mountaineer, and his talent for human relations alone kept the Unit at the front during the tragedy of Ypres. Young does not overstate the case when he writes, "By this patient manoeuvring at many H. Q.'s we had secured for our men the opportunity of saving several thousand soldiers' lives, and very many thousand lives of civilians and children, where there had been no one else so placed, at the time, as to be able to do anything at all". In Italy, as in Belgium, the drivers and doctors of the Friends' Ambulance Unit enjoyed a deservedly high reputation for their determination to spare the wounded unnecessary pain.

After the war Young worked as an European consultant to the Rockefeller Foundation and from 1932 to 1941 he was Reader in Comparative Education at London University. In 1918 he married Eleanor, daughter of that great mountaineer William Cecil Slingsby, who survives him with their son, a member of the Alpine Club, and daughter. Young was fortunate in his marriage. His wife had an affectionate understanding of his endearing weaknesses and a discerning admiration for his great qualities both as a man and as a writer. Her selfless devotion to him helped him to endure the long months of his last painful illness.

Young's first climbing season was in 1897, his last in 1935. His guideless climbs included the first ascent of the south-east ridge of the Nesthorn, but once he had met the incomparable Joseph Knubel the partnership between the greatest amateur and greatest professional of that particular decade was never again broken. In an entertaining paper read to the Alpine Club, *Two Days With a Guide* (*Alpine Journal*, 1909, page 472), Young writes:

"I admit that I climb with a guide. The confession is painful but necessary, and I must hope that the weakness will be attributed not so much to a want of originality as to a preference for a sense of security. I find that, take him all round, the guide meets me in better training, lasts rather longer, and occasionally climbs even better than the majority of amateurs with a month's holiday...

"Yet the gentle art of managing a guide, digging him out of the depressing public opinion of the hut, humouring his local climbing superstitions, pressing him when he is only pouting, knowing where to yield when his real instinct is speaking, cheering him along when he's off under full sail, has its own fascination for the pseudo-psychologist, apart from the pleasing sensation of his stability at the further end of the rope."

Alain de Chatellus, in *Les Alpinistes Célèbres*, credits Young with the power which Talleyrand regarded as the hallmark of superior personalities, the power to use other people to ensure one's own success, and he considers that Young's association with Knubel "had far more in common with that which unites members of a guideless party".

No mountaineer of that period had a longer list of new ascents. These included a new route up the Weisshorn from Zinal, the south-west face of the Dom, the east and west faces of the Zinalrothorn, the Younggrat on the Breithorn, the south face of the Täschhorn, the south face of the Ecrins, the west and east ridges of the Jorasses, the Brouillard Ridge of Mont Blanc from Col Emilio Rey, the direct ascent of the Grépon from the Mer de Glace, and his last great climb the Rote Zähne Ridge of the Gspaltenhorn. After his leg had been amputated he returned to the Alps and climbed the Wellenkuppe, the Weisshorn to within 500 ft. of the summit, Matterhorn, Petits Charmoz, Requin, Grépon and Zinalrothorn. He achieved Monte Rosa in an 18-hour day. "To at least one of his companions", writes Sir Claude Elliott, who was the companion in question, "this appeared to be the greatest physical feat he had ever witnessed".

To have climbed one great peak with an artificial leg would have been a praiseworthy stunt, but to continue climbing peak after peak in spite of this grievous handicap was only possible to a man of Young's indomitable spirit.

Young's most difficult climb was the Grépon from the Mer de Glace. Modern climbers grade pitches from I to VI and the most difficult section of this climb, which Knubel climbed, is graded V sup. by "axe-point nicking into hard rock". This section, according to the *Alpine Journal*, XXV, page 740, "removes the climb outside the class of those that can be justifiably or even sanely led by more than two or three men now living". Modern rock specialists who are tempted to smile at this verdict should remember that Young's party climbed in nailed boots, a very different matter to climbing in rubbers.

The remarkable advance in rock climbing standards began just before the First World War. The ascent by S.W. Hertford and G.S. Sansom of the Central Buttress of Scafell was the only climb of that period which still enjoys immense prestige with the modern climbers. Hertford who was Young's companion on the Rote Zähne was killed in the First World War. Had he lived, he would have been among the first to raise the standard of rock climbing from the Vth grade, which he had attained, to the VIth grade. Young would never have claimed to be as good a rock climber as Hertford, but he was perhaps the best all round amateur of the day. That great Swiss mountaineer, Alfred Zürcher, in the course of a speech at the Alpine Club said, "Once I asked Joseph Knubel whom he considered his best amateur climber, he said without hesitation: 'Mr. Young was just as good in the mountains as I ever was', probably the finest compliment one of the world's most famous guides could ever pay".

My friendship with Geoffrey Young began when I reviewed his poems *Wind and Hill* for *The Isis*, the Oxford undergraduate journal of which I was at that time the Editor. Our friendship illustrated the strength of the mountain bond for he had not a great deal in common, other than the mountain link, with his "queer rough interesting friend" as he once described me to a mutual acquaintance. Our other point of contact was our insatiable appetite for books. Young was not only a great reader but a fascinating conversationalist on literary themes. As I write I recall his room in London, with overflowing bookshelves right up to the ceiling, and the long happy hours when we talked books and mountains.

Young had his enemies both within and without the Alpine Club. He was accused of vanity and affectation, but there have been few creative artists, a term which includes those whose medium is the written word, who have *not* been vain. Most of the greatest artists have been inordinately vain. We insult our fellow men if we are so proud as to be indifferent to their good opinion, and we pay them a compliment by the vanity which welcomes their praise.

Young took immense trouble over his occasional contributions to the *Alpine Journal* and I made a point of writing to him when I had particularly enjoyed what he had written, as for instance his admirable obituary of Franz Lochmatter which has never been reprinted. "In conversation", said Samuel Johnson, "praise is instantly reverberated", but Young depended more than most people on "reverberation" provoked by what he wrote.

Vanity is mischievous when it distorts a man's judgement of his own achievement. Young, because he normally climbed with a guide, was tempted to minimise the very real distinction between guideless and guided climbing, as for instance in the following passage from *Mountain Craft* :

"... he will not allow his decision to take a guide to be influenced by any fear that the credit of his party will be diminished in any competent mountaineer's eyes by the fact that a prejudiced or a thoughtless modern virtuousity might jeer at it as 'guided'."

Geoffrey Young grew up in a house built by his great grandfather, Admiral Sir George Young, on an island in the Thames, which the Admiral called "Formosa" because it was "the loveliest place that he had seen in the world". His house was constructed on the plan of a battleship, with portholes on the ground floor. The plans were approved by King George III and an old battleship was topped up the Thames and broken up on the lawns to provide oak for the walls.

Sir George Young was my first landlord after I married. Lady Young prevailed on him to let me have a charming house, near Formosa, at a rent which though modest proved more than we could afford when the war began. Suttoncroft, Cookham, was within a few hundred yards of Formosa on the Thames.

I have never been happier, even in my beloved Alps, than at Suttoncroft. The memory of the unmarred felicity of those early months of married life has resisted the erosion of time and has been reinforced by the incidence of Death.

"Are not the best beloved of years
Around our hearts for ever?"

On Sunday afternoons the lawns at Formosa would be crowded with Geoffrey's friends. It was a great privilege for a young man to meet so many of the more brilliant intellects of that period.

Sir George Young and his sons fought between them seven unsuccessful elections as Liberal candidates before Geoffrey's younger brother Hilton, now

Lord Kennet of the Dean, was elected a Liberal in 1915. Hilton had a distinguished war record. He took part in the brilliant action at Zeebrugge in which he lost an arm. In 1929 he was elected to Parliament as a Conservative and later raised to the peerage as Lord Kennet of Dean.

Most of those I met at Formosa were Liberals. The Liberal party was an uneasy coalition not only between the successors of the old Whigs and the Radicals but also between Nonconformists and secularists. Geoffrey and most of his friends would have thought it a waste of time to attack religion. They preferred to ignore it.

The pattern of nineteenth century politics in England is recognisable in Burke's analysis of the struggle for power which preceded the French Revolution. The object of the Jacobins, so Burke maintained, was to transfer political power from the landed gentry, who were closely associated with the Army, to the cities, to "tradesmen, bankers, advocates". "Men of letters", he added, "hitherto generally thought the most peaceable (and even timid part of society) are the chief actions of the French Revolution". The class struggle in Victorian England had much in common with the first phase of the French Revolution. The landed gentry, most of whose sons served either as regular or territorial officers in the Army, were staunchly Conservative. The Victorian Liberals, on the other hand, were recruited very largely from upper middle and middle classes, from leaders of the industrial revolution, from Nonconformists with a strong bias against the Army, and from intellectuals. For such Liberals victories were to be won not by the bullet but by the ballot. The ballot men, often secretly envious of the bullet men, console themselves by despising the bullet men as unintelligent. That brilliant cartoonist Low was a typical ballot man and as a target for his satire he selected a regular officer, Colonel Blimp, who was always represented as a complete ass. A careful study of Colonel Blimp in the thirties is a little disconcerting to Mr. Low's admirers, for it would seem that it was Blimp who showed prescience and Mr. Low who was blind. Shortly after Hitler had assumed power, Blimp was derided by Low for exclaiming, "To ensure peace we must have plenty of aeroplanes", and again in the same year 1934 for his naivety in remarking, "By God, Sir Winston is right. We must have more armaments".

I never heard anybody discuss the possibility of war on the quiet lawns at Formosa. I myself shared the illusions and prejudices of Geoffrey's entourage. It never crossed my mind that Field-Marshal Lord Roberts of Kandahar, who was campaigning at that time for conscription, was a better judge of the European situation than the clever people I met at Formosa or than the Editor of *The*

Nation, the oracle of those clever people, and the predecessor of *The New Statesman*, who asserted that "on the German side Social Democracy, with its 20% of soldiers in the German Army, will stop war and the growth of German armaments". It is interesting to contrast this kind of nonsense with the prescience of Roberts of Kandahar, who as early as 1908 predicted that the war would break out in 1914 and would be won by the allies under the command of a then unknown French Colonel, Ferdinand Foch, quoted by Douglas Jerrold in *Georgian Adventure*.

Young in his fascinating book of memoirs, *The Grace of Forgetting*, recalls the illusions which I shared, when in the last weeks of the war "it really seemed to us that the Golden Age was beginning, and the hopes of our early Liberal sympathies were finding fulfilment as the news came in hourly almost of falling dynasties. The illusion was not fated to last long. Nor has it returned". Yes, the dynasties fell and in due course Lenin replaced the Tsar and Hitler the Kaiser and the illusion of a Golden Age proves shortlived.

Why were all these clever men who believed themselves the van of progress so incapable of understanding the world in which they lived and of predicting the shape of things to come? Why, again, did so many of them welcome with enthusiasm the Russian Revolution as the dawn of yet another Golden Age?

Maynard Keynes, later Lord Keynes, who was among those who welcomed the Bolsheviks as the architects of Utopia and whose book, *The Economics of the Peace*, profoundly influenced the course of events, suggests one explanation for his own failure to foresee the horrors of Nazism and Communism. In his memoirs he writes: "We repudiated all versions of the doctrine of original sin, of their being insane and irrational springs of wickedness in most men. We were not aware that civilisation was a thin and precarious crust erected by the personality and the will of very few and only maintained by rules and conventions skillfully put across and guilefully preserved. We had no respect for traditional wisdom or the restraints of custom. As cause and consequence of our general state of mind we completely misunderstood human nature, including our own."

"Every man", writes Samuel Johnson, "thinks meanly of himself for not having been a soldier or having been to sea. The profession of soldier has the dignity of danger". And this sense of inferiority perhaps explains the determination to belittle or even to ignore the great qualities which war tests. In the First World War Young was for a few weeks a war correspondent of the great Liberal paper, *The Daily News*, and expressed what many of his readers believed or wished to believe when he wrote: "The uncertain outlines of the Waterloo monument in this grey half light, have a sinister look. How soon will the squalor of these

new fights be, in its turn, converted into such memorials to entrap new generations into dreaming that there is still glory in war.”

During the later phases of the Battle of Britain I dined in the Mess of a Fighter Squadron. It was at a time when, as I knew, we were down to our last reserves. The survivors were given far too little rest, and many of those whom I met that evening looked drawn and tired. Those young men who, day after day, faced overwhelming odds in the air, had not been “entrapped” into war by the hope of glory. They fought and continued to fight because no normal Englishmen would have wished to survive in an England conquered by Hitler. Was there no glory in England’s “finest hour”?

Sir Alfred Wills, from whose ascent of the Wetterhorn in 1854 it is customary to date the beginning of the Golden Age of mountaineering, remarked to Geoffrey Young, when he proposed him for the Alpine Club: “The Alps may profoundly influence your philosophy of life when you are old enough to have one.” As indeed they did, but Young’s philosophy of mountaineering was also profoundly influenced by his secular and Liberal philosophy. In his famous book, *On High Hills*, he describes the first impact of the First World War: “When I thought of the mountains, it was only to wonder whether I should discover at last that the sensations I had found among them were only the pretence, the self-deceptions I contrived to make an adventure out of quiet living, which the world was accustomed to pronounce them, and that the battle thrill, the imminence of danger less calculable, was—as it claimed—the real thing. It took but a few months of the fitful fevers and long fears of war to answer that question for me decisively. Those indignant and compassionate reactions—how could anyone who had lived through even a week of bombardment in Ypres and a day of action and sight upon the Matterhorn continue to compare the jangling monoton of death with the deep resonant chords of life—with which our life, with which our every sense responded to the chief things of the ancient mountains and the precious things of the lasting hills.”

Of course a day’s climbing on the Matterhorn which ends with a good dinner and a comfortable night in bed is incomparably pleasanter than the discomfort and perils of the front line trenches. Those who climb do so for their own amusement, but it was the wholly exceptional front line fighter who was consistently happy. The motive which compelled so many splendid officers to decline a staff job and to return to their front line battalion was very different from the motive which inspires the mountaineer. If, however, I were to adapt Young’s comparison between being bombed in Ypres and mountaineering I can only say that my

experience of London during the great raids leads to conclusions different from his. The satisfaction which is the reward of a climber who has accomplished a difficult climb, particularly if the conditions are adverse, storm for instance, ranks far below the corporate pride which sustained us during the great raids of 1940, the pride of knowing that the hope of the nations which had been overrun, and the hope of those who would have been overrun had we failed, was founded on their conviction that "London can take it".

Young's essay *The Influence of Mountains upon the Development of Human Intelligence* (The W. P. Ker Memorial Lecture; Jackson, Son & Company, Glasgow) illustrates Anatole France's apothegm: "*J'ai remarqué*", writes Anatole France, "*que les philosophes vivaient généralement en bonne intelligence avec les poètes. . . Les philosophes savent que les poètes ne pensent pas ; cela les désarme, les attendrit et les enchante*". The flowering of Greek genius was due, Young claims, to the balance and proportion of the mountains and "the definiteness of the Greek sunlight". In point of fact the Greek mountains are dull and undistinguished and there is nothing in the Greek combination of mountains, blue seas and "definiteness" of sunlight which cannot be matched elsewhere, in the American continent for instance, both north and south of the Equator. In Italy, we are told, "there was a structural disproportion in some great part of the Italian scene, which dissipated much of the concentration of environmental effect" and therefore the inspiration "would have died out but for the recourse to Grecian sources". The influence of Greece on the Renaissance has, as Spengler showed, been grossly exaggerated. "The Renaissance", he wrote, "never even touched the real Classical, let alone understood or revived it. The consciousness of the Florentine élite, wholly under literary influences, fashioned the deceptive name to positivise the negative elements of the movement—thereby demonstrating how little such currents were aware of their own nature. There is not a single one of their great works that the contemporaries of Pericles, or even those of Caesar, would not have rejected as utterly alien". Be that as it may, the attempt to explain the differences between the artistic developments of Greece and Italy in terms of the influence of their respective mountain ranges is a fascinating example of Young's ingenuity as a special pleader, for no explanation of the flowering of genius as a product of material environment even begins to be plausible. If the environment had such influence why was its influence restricted to a comparatively brief period? In Athens, as later in Florence, the creative period was followed by long centuries of sterility. Greek art petered out in Alexandria, where painters with no inspiration invented new tendencies with which they successfully bluffed the public. Florence sank to the level of

Salvator Rosa. The truth is that literature not art was Young's province. I never found in his writings or heard in his conversation any informed comment on art or architecture.

"*Les poètes ne pensent pas*" is only a partial explanation of the inadequacy of Young's attempts to analyse his own response to mountain beauty. Again and again Young seems to be hovering nervously on the frontier of pseudo mysticism. "The structure of a solid mountain block", he writes, "does affect us in some way spiritually", but he makes no attempt to explain why, and he can write of the "semi-divine or fourth-dimensional quality of the relationship between some men and some hills" and just leave it at that. Young had been conditioned to believe that enlightened people do not waste time discussing the supernatural, and it was this conformity to the intellectual fashion of his entourage which prevented him drawing explicit conclusions from the spiritual implications of his mountain philosophy. Indeed he very much resented being invited to be more precise. While he was writing *Mountains with a Difference* I urged him to clarify his own interpretation of the influence of mountain beauty on man. He replied angrily: "No, I'm dashed if I'm going to start formulating aesthetics for you! I expect I look fundamentally on the whole show as a set of forces, experienced in various forms and currents. And some in combination contributing to 'good'. And the reaction of the human life force from the mountain personification belongs to the good... Well, well."

Any attempt to interpret man's response to the mountains is of interest, provided it be distinguished by clarity and integrity. One of the most moving and beautiful passages in mountain literature is from the pen of an atheist, Llewelyn Powys, who died at Davos and whose passage on the Aebi wood above Davos ends: "In December, January and February it is the austerity of the wood that becomes specially apparent. Then it is that the stately fir-trees, standing motionless in their white bondage, lift up patient heads of endurance in an astral universe without an end or a beginning, in a universe which to the fugitive race of men subject to death must for ever remain incomprehensible."

Young's closest approach to a *confessio fidei* will be found in a paper which he read to the Alpine Club: *Should the Mountain be brought to Mahomet?* (A. J. 52, 172), but it is a statement of faith in which the great issue is evaded and in which his own beliefs are concealed rather than revealed. You know exactly what Llewelyn Powys meant in the passage I have just quoted, but I doubt if even Young himself could have explained passages such as these: "When we place ourselves

actively in contact with a hillside, associate our brief activity with the slower rhythm of change of life within it and upon it, our eyes with its forms and colours, our ears with its sound and silence, our hands and feet with its modulating surface—in a word, when we set our wholeness of conscious life in continuous moving contact with its differently timed existence, we are establishing a relationship between the mountain personality and our own; by which I mean the rhythm of life and order by which we live.” Young, of course, does not explain what he means by “mountain personality”; “personality” is an attribute of life and the mountains are dead, yet as Leslie Stephen said, “in spite of all reason we are tempted to attribute some shadowy personality” to the mountains. No clue to this mystery emerges from the smoke-screen of unilluminating metaphors in the above passage, but in his finest poem there are stanzas which instead of attributing personality to the mountains, an attribution which is irrational, Young writes as if there had been moments among the mountains when he was conscious of the companionship of a personality wholly distinct from the personalities of his climbing companions.

I never see him, but his tread
Sounds just before my own;
One thought designs the task of day,
One effort wins the upward way,
Dividing, yet alone;
One hope, one vigour of intent,
Swayed by one resolute consent
Of sympathy unsaid.

He shares the song-time round the fire,
The morn-break bitterness;
He revels in the sheer ascent,
And finds new worlds for wonderment
In every grim recess;
Sure foot to grip the perilous ledge,
Strong hand to grasp the rough-glad edge
Of each unconquered spire.

He opens an enchanted gate
For each untrodden ridge;

He cleaves the blue precipitate stair
Up the white domes of frozen air,
And moulds the foam-snow bridge;
How small the earth to those wide eyes,
And the near welcome of the skies
How infinitely great!

This poem may not explain why, in Young's own words, "a solid mountain block does affect us in some way spiritually", but the poem impresses me as being the product of a genuine spiritual experience.

No writer has made a greater contribution than Geoffrey Young to mountain literature. In the difficult art of the word painting of mountain scenery he is surpassed only by Leslie Stephen and Martin Conway, and in all the literature of mountain adventure there is nothing more enthralling than Young's famous story of the Täschhorn climb. I am proud of the fact that I am partially responsible for two of Young's books. I persuaded a publisher that the Badmington volume of mountaineering was out of date. Young's *Mountain Craft* was the result of this suggestion, and Young's *Mountains with a Difference* of an invitation to contribute to *The New Alpine Library* of which I am the Editor.

In many of his essays Young has made an invaluable contribution to the history of mountaineering not only in the Alps but also in Great Britain. His Alpine Club paper, *Mountain Prophet*, was invaluable to me as a source when I wrote *A Century of Mountaineering*. His characterisation of many of the great pioneers was superb, incomparably better than anything else that had been written in this line. Again nobody has defended more effectively the sane tradition which condemns the acceptance of risks as great as those of war. "If we begin to accept", he writes, "an interpretation that justifies young men in waging duration of life and the duty owed to it upon a haphazard adventure so unchancy that it exacts, sooner or later, the penalty of death from a large proportion of players, we are outside any definition that seems applicable to the idea of a game".

Finally, though mountain beauty is the theme of many poets, Young is the outstanding poet of mountaineering.

I hope I shall not be accused of being biassed by friendship when I claim that the range of Young's mountain writings is unique in mountain literature. Certainly no other mountaineer has written with outstanding distinction of mountain scenery, mountain adventure and mountain history and has also been acclaimed for his interpretation of mountaineering in poetry.

His literary ability did not decline with the years. On the contrary, much of his best work was written in his eighties, as for instance his admirable contribution to *The Mountain World*, in which he deplored the increasing tendency of mountain narratives to be written in the style of an engineer's report. And he wrote nothing finer than the last paper which he read before the Club.

I hope to induce a publisher to enrich Alpine literature with a book containing not only some admirable work which has not appeared in book form but also the originals of much that was rewritten for *On High Hills*. Young was always tempted to spoil the simplicity of the first version by overwriting. In his story of the north face of the Weisshorn, as originally written for *The Cornhill Magazine* (1912), there is a description of a bivouac which illustrates Young's power to evoke a mountain scene in a few words.

"A current of wind blew the clouds round our peak, and I could watch it towering, frostily remote and lit by an unseen moon, through a window of clouds that ravelled into silver where they framed its image."

He rewrote but did not improve this delightful word picture for a chapter in *On High Hills*:

"A ruffle of wind blew a window in the clouds overhead, a lucescent oval in darkness, ravelled into smoke-silver round its edges by the hidden moon behind. And through the oval I was looking suddenly at the dream-white peak of the Weisshorn, impossibly remote, unearthly in its concealed illumination, unreal in its frosted loveliness."

Again, anybody who compares Young's story of the great Täschhorn adventure as first written for the *Cornhill* with the chapter on the same climb in his book will, I am sure, agree that the first version was best.

Young was disappointed by the fact that his poetry made little stir outside mountaineering circles. I cannot remember a single reference to his work in any critical essays on modern poetry. This does not surprise me, for critics who are not themselves mountaineers could hardly be expected to appreciate the mountaineering poems which are incomparably superior to the rest of his poetry. Even so I do not believe that the best of his poetry attains the same high level as the best of his prose. On his return to the Alps after losing his leg he wrote a poem of great beauty which opens:

I have not lost the magic of long days,
I live them dream them still;
Still am I master of the starry way
And Freeman of the hill.

Shattered my glass ere half the sands were run,
I hold the heights, I hold the heights I won.

But I was less moved by these noble lines than by the more direct and simpler appeal of a passage in which he writes of his return to Belalp after the war as a cripple:

“As I tramped up to Belalp, the region of happiest early memories, summit after summit, familiar and beautiful, appeared just where it should in composure, in friendly sameness, refreshing in its image upon memory with considerate reserve. A chalet had been built here, a path bettered there, there was less snow above the glacier than the season warranted. But regretful? or painful?—surrounded by the tranquillity of these old friends, still unalterably young, I had only to light a pipe, put my feet up metaphorically against the mantelpiece, and speed fancy confidently adrift for the first time since I had seen them last.”

Few men exercised greater influence on mountaineering through the medium of the written word, an influence which in Young's case was reinforced by his constant contact with the young. He was the first of his generation to take an interest in the Oxford Mountaineering Club which I founded and it was he who encouraged me to edit and produce *Oxford Mountaineering Essays*, which is still being read. He lived for many years at Cambridge, where he was accepted as a discerning mountain prophet by the changing membership of the Cambridge Mountaineering Club. He was the only President of the Alpine Club whose term of office began and ended during a world war, and his great services to the Club during that period are recorded in *A Century of Mountaineering*.

The centenary celebration of the Alpine Club in 1957 officially concluded with the paper which Geoffrey Young read to the Club in December. Some of us knew that Mrs. Young had just been informed by the doctors that the results of the last examination proved that cancer had returned in a virulent form and that Young had only a few weeks to live. Mrs. Young had kept this news from her husband so that his last evening in the Club should be as happy as possible. Young must have guessed that he was doomed and he had to mobilise the last resources of his stubborn courage for his final appearance at the Club. His voice never flagged. The manner in which he read the paper was admirable as the paper itself. Nobody in that audience who did not know that his doctors had abandoned hope would have guessed that he would take to his bed next day and remain there till he died.

Part of the paper consisted of an attack on the tendencies of a technological age which Young, who was nothing if not a humanist, deplored:

"But our own young men also were dreaming dreams. One, introduced as having been of the Everest party and therefore an authority on adventure, assured many millions of us that he would prefer to take some part in launching a sputnik into space, because that heralded a new era, to sharing in an Everest campaign, which was but the expiring flicker of an age outworn. Such a mind, having misconceived the so-called 'conquest' of a summit as the be-all and end-all of mountaineering, found it no more perverse to say that, rather than share in one heroic episode in the hardest and most enduring training ever contrived to reinforce the spirit of young manhood through many ages to come, he preferred to assist in dispatching a rocketing dog some atmospheres higher than his contemporaries could shoot a rocketing pheasant."

Young was unmeasured in his dislike of artificial climbing, and he was particularly affronted by what he considered to be the desecration of our British cliffs by pitons, for his thesis was that artificial climbing was organically related to Nazism and Fascism. This was rendered untenable when many of our own climbers began to master these new techniques:

"These armies of boys and girls, practising their wholesome, openair week-end callisthenics, flooding up the valleys in hale and hearty chase of pins and needles, upon which to thread their ropes and clamp and cushion their athletic limbs upside-down. Was theirs the same relationship as ours, with the harsh and wind-swept summits and the more distant white domes? Was theirs perhaps only a nodding acquaintance... or some platonic crossing of a high pass in order to be able warmly to embrace a new rock buttress? I wondered. And I wondered again most futilely, this last Easter, as I looked up at the head of an old hill friend, abandoned once again to solitude through the years, and somnolent above the clanking of the slab-queues far below—supposing I were to shout from the road the Old Testament alarm cry, 'The Philistines be upon thee, Samson!' would rouse up, and shake his vasty shoulders, and the fetters and the rings fall about his rocky knees like wintry-sounding scree?"

Towards the end of this passage the gallant survivor from what Spengler would have described as the spring-time of our mountain culture cycle raised his voice, looked up from his paper and glared friendly defiance at any pitons heretics in his audience. I can still hear the snort with which he exclaimed: "The Philistines are upon thee."

But the paper ended on a nobler note than that of controversy. Young never

wrote anything to match the beauty and the sorrow and the sincerity of the peroration:

“What held us together for a century may, then, well guide, or condition, our future as a Club. Not personal prowess, or competitive achievement. But the understanding of that which mountains—and mountains only—mean to us: the long harsh days of endurance and discipline, on deep snow; the hours of splendid sunshine, of glorious self-forgetfulness, and of movement as upon wings, into adventure, into beauty, and, best of all into the unknown; the hours of blizzard, and of iced rocks, and of the little cat’s-paws of fear, that die away again as fate is pushed back step by step and grip by grip. Most memorable—that hour before dawn, upon cold high glaciers, with darkness shifting frostily upon formless shadows, and the long sighs out of unseen space quivering through the suspense, that suspense we all have known among mountains at this hour, the cold craving for life which filled chaos before earth took form.

“And then—the miracle of the coming of light, as it breaks only over great mountains. Light alive with a purpose, the assertion of new living; not merely the ending of darkness, but a light which creates everything anew at each dawn, calling all the peaks and glaciers about us into a new declaration of lovely forms and colours, and bringing out of dead matter and darkness a fresh resurgence of cleansing spirit, into which we ourselves are absorbed as we begin to climb, and in which we feel ourselves to have been newly refashioned.”

As his musical voice lingered on the phrases which evoked the remembered loveliness of the hills we knew that from the valley of death he was lifting up his eyes to the hills of memory and that from those hills help would come in his struggle against the last assaults of pain and weariness. Gratitude rather than regret was the note struck in this noble farewell to the Club, a mood very different from the pagan sadness of Homer’s saddest line:

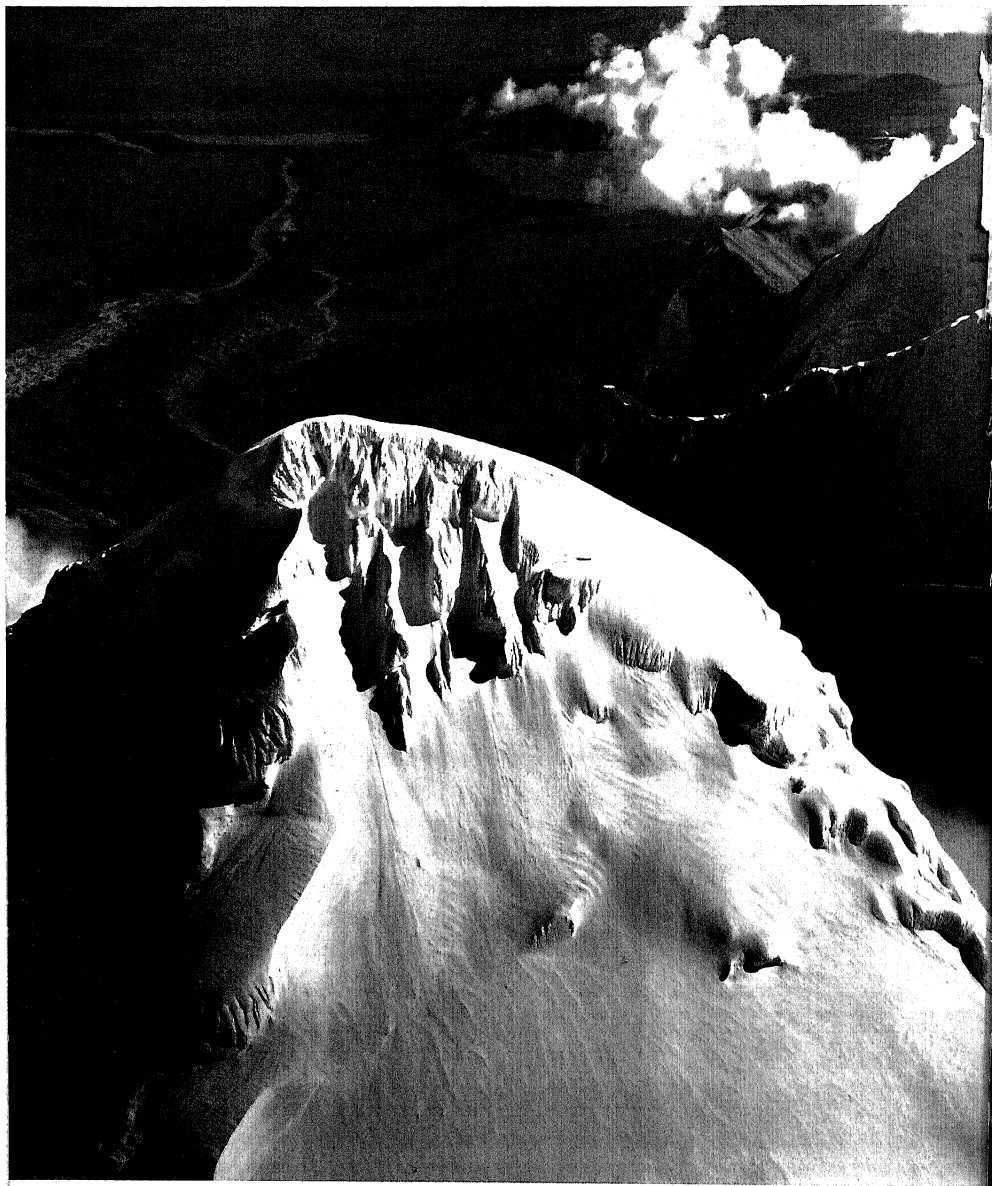
Καὶ δὲ γέρων τὸ πρὶγ μὲν ἀχδύομεν ὄλβου εἶναι

“and we hear that even you old man were once happy”. Both the manner and the matter of his peroration seemed to hint that there was an enduring element in the happiness of the hills, untouched by the dominion of Death.

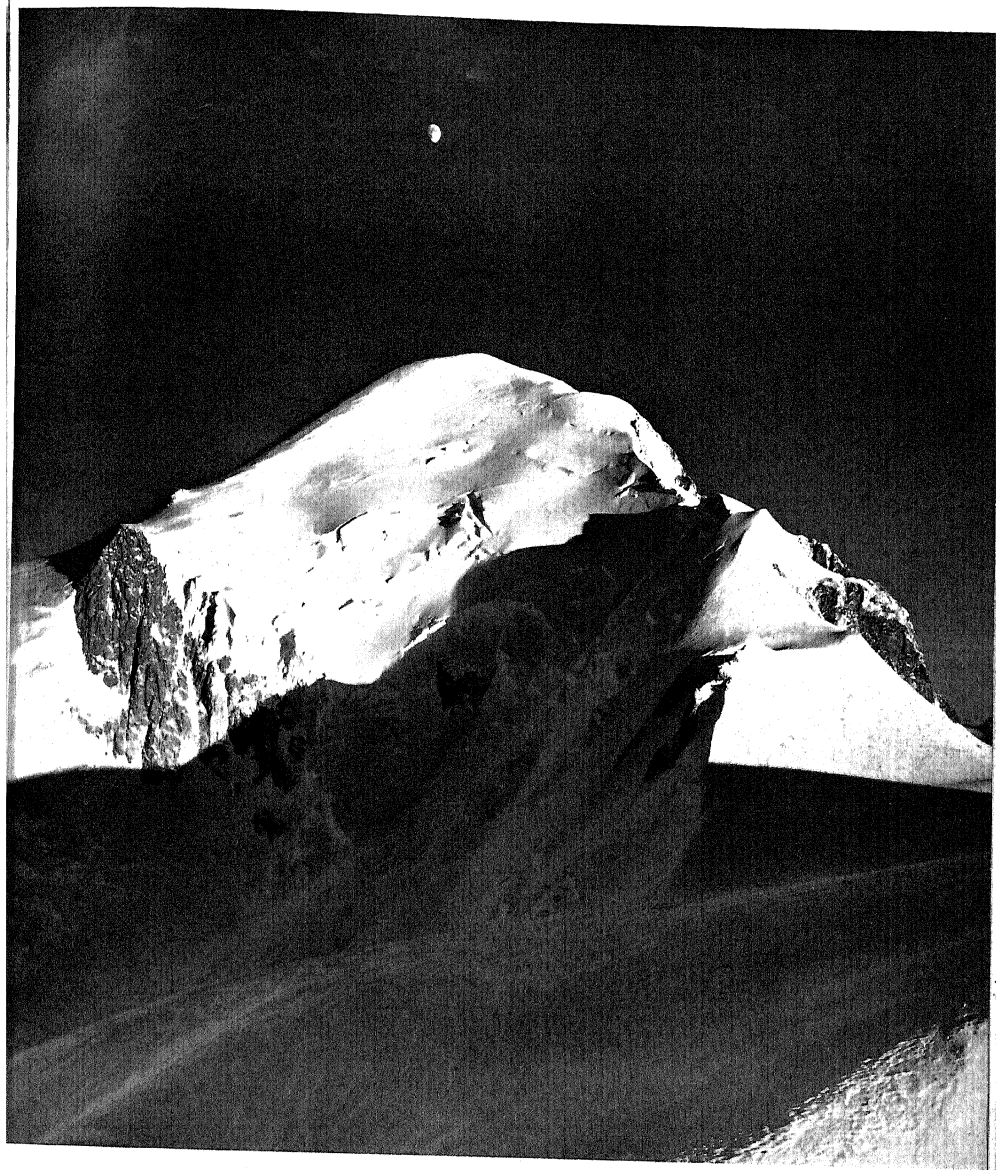
The facsimile reproduced here (slightly reduced in size) is a page from the manuscript of Geoffrey Winthrop Young’s “Courage and Mountain Writing”, written for *The Mountain World* 1955.

5

a fair-sized reading public; and they are well enough informed to make fun of the cut rope and the summit crevasse, and to expect a heroine, if ^{mentioned at all,} present, to lead the Mummy Crack. They are greedy for technical details, and ^{for} reports about peaks & precipices which they have climbed or intend to climb. Since custom, and an easy approach by car, rail and aeroplane, have now deprived their homeland hills, and the nearer Alps and Pyrenees, of the qualities of surprise and novelty, and of the romance that once enveloped every great summit, they form a reading public that is suspicious of sentiment and of all picturesque writing. To the young scientific mind in this 'machine age', the muscular movements in climbing are mechanically explicable, and therefore sympathetic when described; ^{but} ~~but~~ the emotions implicit in mountaineering are much less calculable; they complicate the pure acrobatics and provoke too much thought. These climbers ask only for facts, facts and details. Details make a solid groundwork for the feet, and facts for the mind. Of the thousands who now go off, most healthily, every week-end to climb on rocks and cliffs, for the sake of the physical satisfaction and sense of well-being which this admirable exercise gives to the mechanism of their bodies, only a limited number have ^{ever} ~~ever~~ given themselves the chance to experience the enchantment of long days of effort high among the great peaks, or the benefits ^{which they} ~~they~~ may confer upon mind and spirit. Nevertheless, such climbing is a wholesome practice, and we may be glad that so many pursue this way of health. But, in so far as they constitute a reading public, their limited preferences do not help to produce good mountain

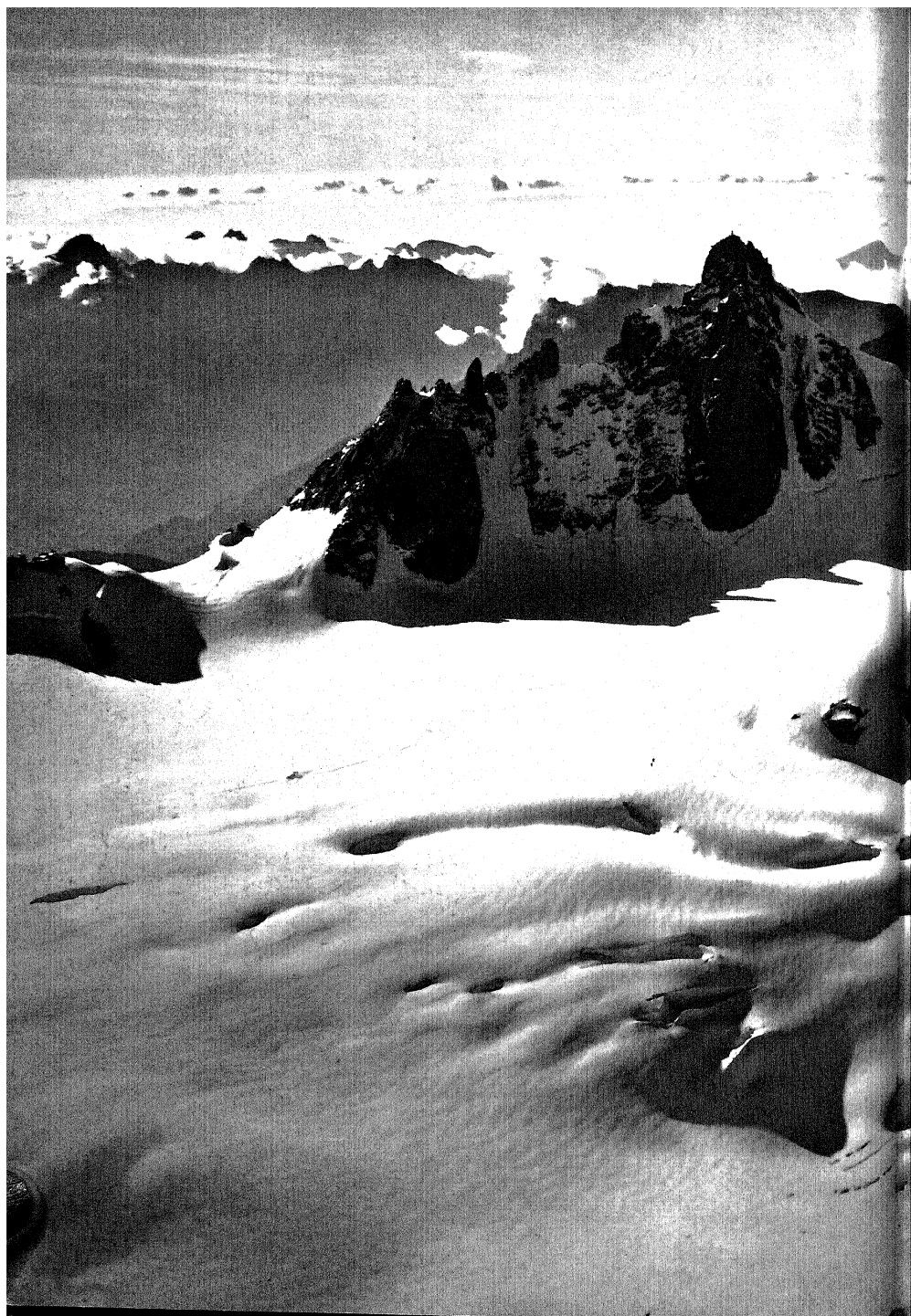


3 THE SUMMIT OF MOUNT HAYES (13,940 ft.) in central Alaska seen from the south.
(Aerial photograph Bradford Washburn)

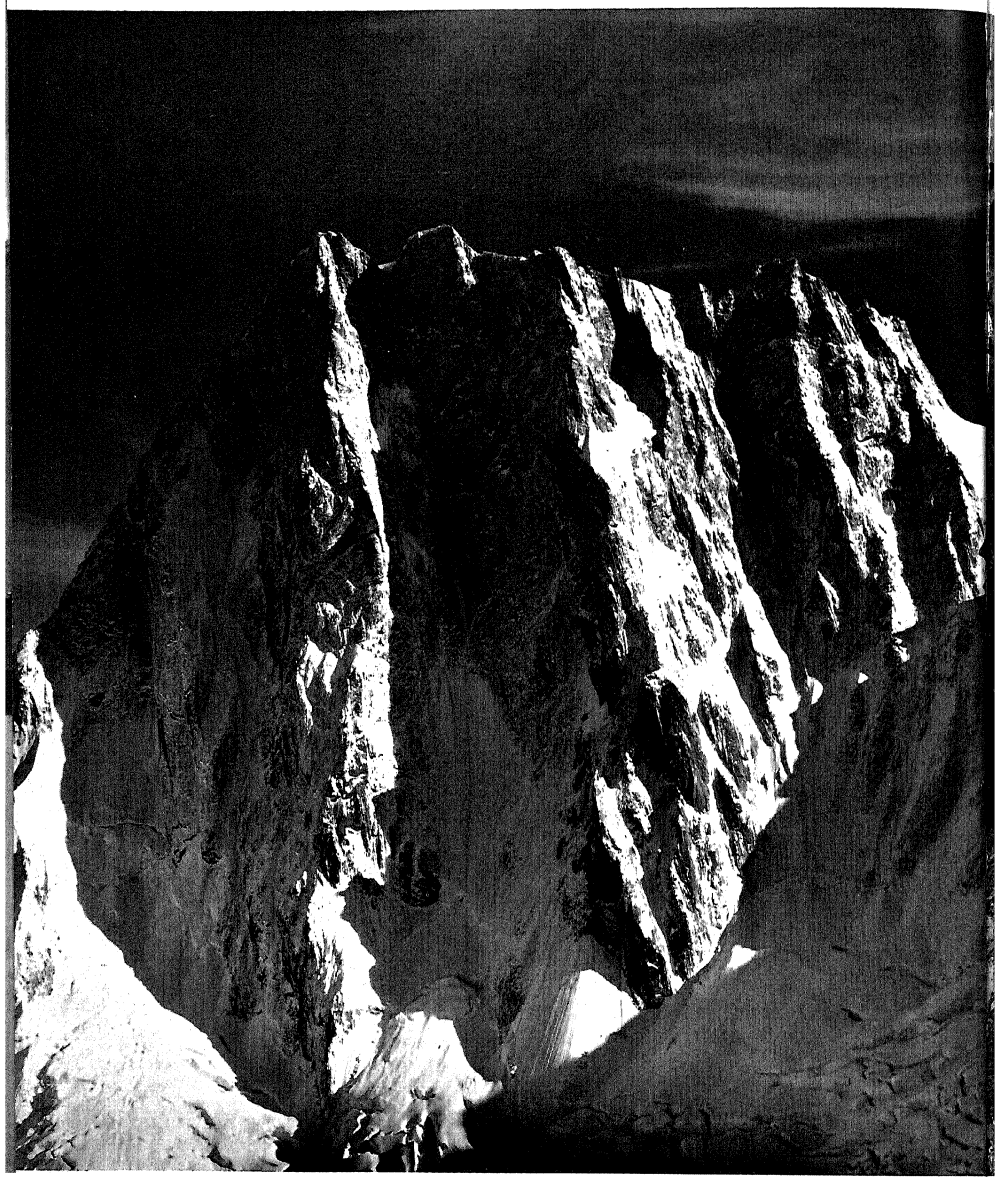


8 SETTING SUN AND RISING MOON over the summit of Mont Blanc (15,717 ft.). On the right the Arête des Bosses. Vertically below the Grande Bosse (white cone) the Vallot Hut (14,300 ft.) and to its left, on the rocks, the Vallot Observatory. In bright sunshine (left) the Rochers Rouges, on the route taken by Paccard and Balmat in 1786 (Ancien Passage).

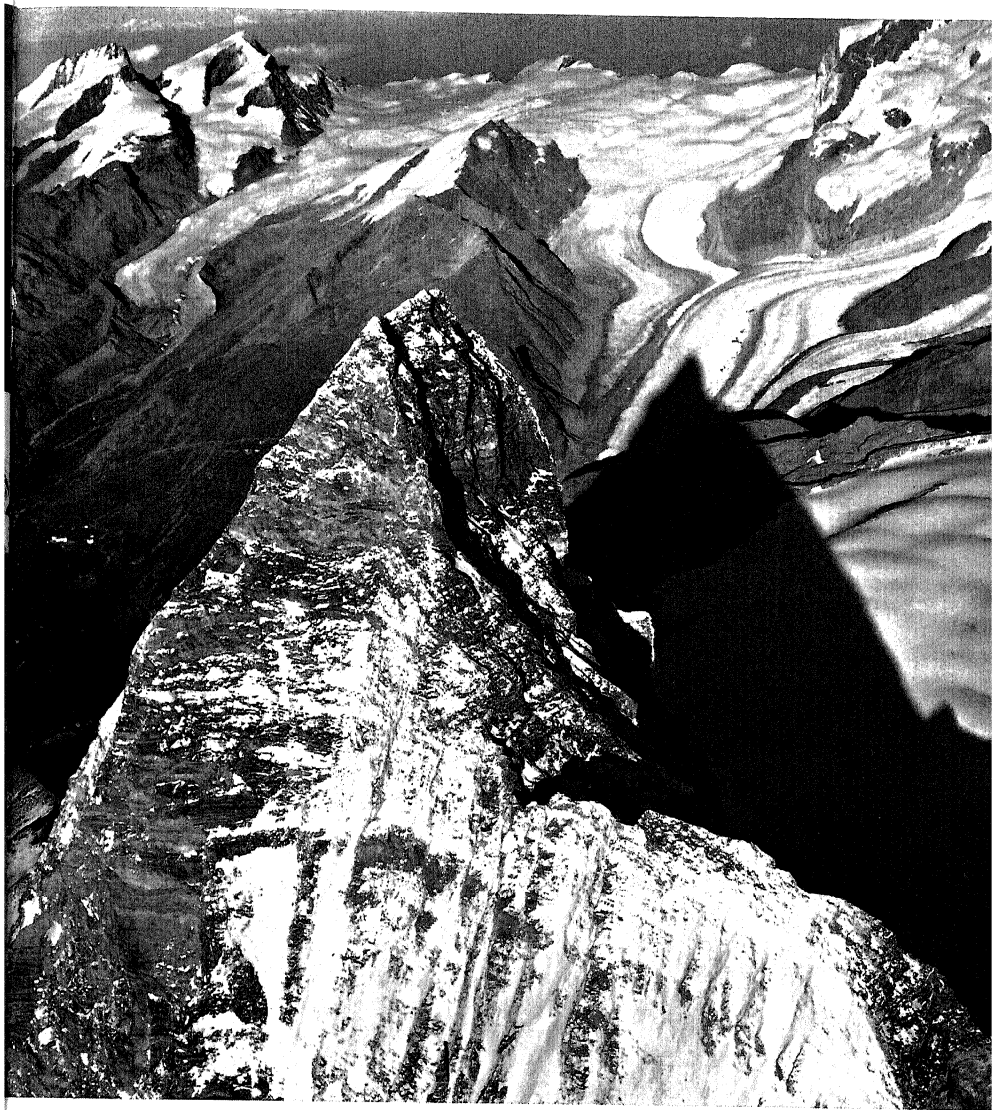
9/10 overleaf: AIGUILLE DU MIDI (12,600 ft.). The normal route follows the ridge to the summit (terminus of the cable-railway from Chamonix). On the left the Col du Midi showing tracks leading to the hut (right) and the laboratory (left). In the foreground the famous Vallée Blanche. (Aerial photographs Bradford Washburn)



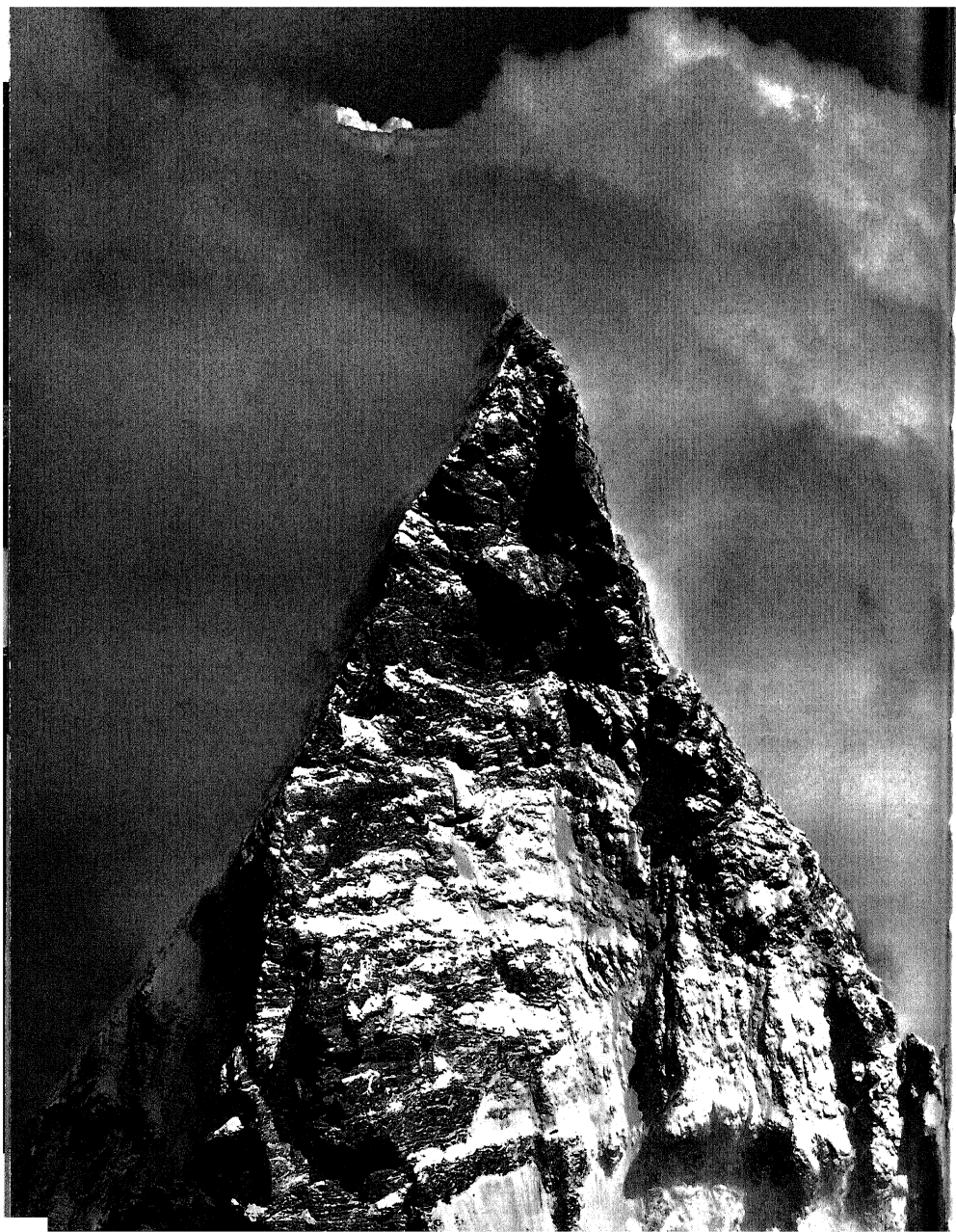




11 NORTH FACE OF GRANDES JORASSES (13,790 ft.). On the left the Arête des Hirondelles, leading to the Pointe Walker, with the well-known Walker-Pillar in front. The other summits (left to right along the crest) are: Pointes Whymper, Croz, Elena, Margherita and Young. On the extreme right, in the sunshine, the Col des Grandes Jorasses (12,550 ft.). (Aerial photograph Bradford Washburn)



12 MATTERHORN (14,686 ft.) seen from west-south-west, casting its shadow on the Gorner glacier. In the bottom left-hand corner the "nose" on the Zmutt-ridge. A little to its right a small section of the west face is showing. On the right in front of the shadow of the summit pyramid) the sunlit crest of the Furggen-ridge. Beyond the shadow (right) the Furggen glacier with skitracks leading to the Theodul Pass. On the horizon, from l. t. r. Rimpfischhorn, Strahlhorn, Cima di Jazzi, Weissgrat, Monte Rosa. On the extreme left of the picture, vertically above the shadow, the white buildings of Riffelalp. (Aerial photograph Bradford Washburn)



13 MATTERHORN west face in stormy weather. The Zmutt ridge (left) and the Lion ridge (right) meet at the so-called Italian summit (14,325 ft). The small triangle shown in the picture is the top section of the west face. In the foreground, at the bottom, the famous "Carrel Gallery". (Aerial photograph Bradford Washburn)

As I reached the hall of 74 South Audley Street I looked back through the half-open door of the Alpine Club, and saw Geoffrey resting in a chair, but talking with something of his old animation. I knew that never again would I see Geoffrey in his own authentic environment, in the historic Club to which he had rendered such unique service. I looked intently to imprint this momentary impression on my mind, and to protect it from the rust of time. And when the door closed I knew that the curtain had fallen on one of the greatest acts in the drama of man's relations to the mountains.

Next day I wrote to Geoffrey to tell him not only how moved we had all been by his paper, but also to find words to express, however inadequately, what his friendship had meant to me. "Your letter reached me in hospital", he replied. "*Most* moving. It has indeed been a long friendship, lightened upon tireless wings of diverting talk. I keep your letter and have re-read it happily."

When I returned some months later from the Alps I saw him for the last time, a few days before he died. He had borne, so his wife told me, his sufferings with uncomplaining fortitude. He could hardly talk, but just before I left he squeezed my hand, found the words which he would know would go straight to my heart, memorable words which it would be as impossible for me to quote as to forget.

I remember finding in one of Young's old photograph albums the photo of a house group at Marlborough. Everybody with one exception was staring woodenly at the camera. The exception was Young, who was sitting in the front row with his face turned to the right. "You see", he said to me, "even at that age I was self-conscious".

To the artist life is a drama with himself in a romantic role, and this sometimes creates a suspicion of affectation. When I first met Geoffrey he was a young man in the early thirties, and he had not yet abandoned experiments in dress in which to express his poetic temperament. It is incidentally odd that if a poet dresses to please himself he is often accused of being affected, whereas if he conforms to sartorial standards imposed on him by fashion he is assumed to be natural.

In most cases prejudices provoked by Young's mannerism were short-lived. Sir Claude Elliott, the Provost of Eton, described in his charming *Alpine Journal* obituary his first meeting with Young in North Wales. Elliott had just left Eton and his three Etonian friends were faintly disconcerted by Young's deviations from the Eton norm. "It took us some little time", he writes, "to decide whether here was a man whom we disliked, or towards whom we could ever feel real

friendship, but once we had made up our minds there was no looking back. There can indeed have been few who have had so many friends”.

Elliott's experience was characteristic. Most of Young's friends had passed through the phases described in Seneca's apothegm: *Post amicitiam credendum est, ante amicitiam judicandum*, which might be loosely rendered: Don't rush into friendship, but trust the friends you make. Young was disarming. Few people can resist for long a man whose conversation was always entertaining and often brilliant, flavoured not only by wit but also by an individual genre of humour. He inspired affection by his intuitive sympathy. I climbed with him after a crippling smash in the mountains. I was under the illusion that he was unaware how much my leg was hurting until I read a reference to our climb of the Mönch in his book *On High Hills*, but I was conscious of and helped by his unspoken sympathy.

Like good wine he improved with age. His range of sympathies extended and his humour was enriched. His affectations, endearing to some, enflaming to others, tended to disappear. My brother, who wrote under the name Hugh Kingsmill and who was rather ribald about Young when they first met before the First World War, spent an evening with him in 1944. Hugh was not only a brilliant conversationalist but had the gift of evoking the best from his company. They had a wonderful evening together. "Geoffrey", said Hugh to me, "is so much mellowed. He really is a lovable old boy".

"No flowers by request" was the motto which Leslie Stephen imposed on all those who contributed to the Dictionary of National Biography of which he was the Editor. I have tried to eliminate from this tribute the flowers of uncritical panegyric, and have been explicit on what seem to me to have been Geoffrey's human failings and on the occasional defects in his writing, but I do not feel that the bias of friendship has influenced my high regard for his outstanding contribution both to Alpine history and Alpine literature.

It would not be easy to suggest all that Geoffrey's friendship has meant in my life.

I wept when I remembered how often you and I
Had tired the sun with talking and sent him down the sky.

Young was not only an exceptionally brilliant mountaineer but a man of great culture. Let us hope that mountaineering will continue to produce men who, like Geoffrey Winthrop Young, can interpret in prose and poetry, worthy of our noble sport, their physical and spiritual adventures among the snows.

AERIAL PHOTOGRAPHY ALASKA AND THE ALPS

By Bradford Washburn

(Remarks on experiences and equipment requested by the Editor)

My first flight over the Alps—in fact, my first photographic flight over any mountain—was with Thoret, the great French pilot, from the little aerodrome at Le Fayet in August, 1929. Georges Tairraz, my brother and I had spent much of that summer making a 16-mm moving picture of the traverse of the Grands Charmoz and the Grépon. We felt that a few minutes of aerial pictures of the region would help give scale and dimension to the Aiguilles of Chamonix and also relate them to Mont Blanc more effectively than ground photographs from any conceivable location.

That brief and successful flight in Thoret's ancient monoplane opened a vast and exciting new vista to me: the whole study of mountains, glaciers and geomorphology from the air. Aerial photography was in its infancy at that time and aerial cameras were extremely crude and simple when viewed by modern standards. Aerial mapping was looked upon with disdain by most geologists and topographers, and very few engineers had yet had the vision of the extraordinary field of photogrammetry as we know it today.

During the next thirty years we have used aircraft and aerial photography more and more in our explorations and ascents among the great mountains of Alaska—partly for practical reconnaissance studies in the planning of expeditions, and partly for the sheer enjoyment of taking pictures of thrillingly magnificent scenery. And, of course, year after year, these pictures helped to illustrate the records of our trips, and these published accounts helped to finance further exploration.

My equipment, then as today, has always been the same. First it was lent to me by Dr. Hamilton Rice of Harvard's Institute of Geographical Exploration; now it's my own property and probably worth almost nothing—an old 1928 model Fairchild K-6 camera which used to belong to my intimate friend, Colonel Albert W. Stevens of the U.S. Army Air Corps, with which he had taken a magnificent series of aerial photographs of the Andes and the first pictures showing the curvature of the earth back in the late twenties.

This bulky old camera (weight: 45 pounds, complete with a full magazine of film) dates from a period when almost all aerial mapping photographs were oblique rather than vertical and therefore it was *made to take oblique pictures*. It also takes a large ($7\frac{1}{2} \times 9\frac{1}{2}$ inch)¹ picture, and I have always been mindful of Vittorio Sella's maxim "use a big negative to photograph big things!" Most modern aerial cameras which take a picture anywhere nearly this size are designed primarily as *vertical mapping cameras* and they are incredibly awkward and hard to handle for oblique work. Their viewfinders are small and badly positioned for obliques. The simple, efficient gun-trigger release of the K-6 has usually been replaced by an automatic motor or a trigger in just the wrong place for oblique use. The maximum speed of the shutter is apt to be very slow ($1/150$ – $1/200$), because most vertical mapping is carried out at great altitude where relative ground movement is slight and high speed unnecessary. Several very good oblique aerial cameras have been developed over the years, but most (if not all) of them take small pictures (4×5 or 5×7 inches) and relatively few exposures on a single roll: 25–50.

The speed of my old focal-plane-shutter K-6 is $1/500$ th second, which yields needle-sharp negatives even from a helicopter. Its 110-exposure magazines are wonderful, as they rarely need to be changed, even on a long complex flight; and its big 12-inch Schneider Xenar f 4.5 lens gives ample speed and definition even with relatively slow film. In fact, over the years, I have taken thousands of pictures with it, testing new and unusual emulsions for my good friends at Kodak's Research Laboratories in Rochester.

In brief, my archaic K-6 is a hideous, obsolete, bulky, heavy old thing which is absolutely perfect for the use to which I put it—a use so ridiculously specialized that any modern camera manufacturer would be horrified at the thought of producing anything like it!

My idols have been Vittorio Sella, Col. Stevens, Ansel Adams, Yousuf Karsh and Edward Weston—all users of large equipment and big negatives—and, although I am deeply attached to my Leica M-3 for 35-mm. color work on the ground and from the air, I'll never forsake my K-6 unless someday I can convince someone to build a first cousin to it, using modern light metals and a lens like the remarkable Wild Aviogon.

In our long and practical use of aerial photographs among the mountains of Alaska, we have learned that, to secure a full understanding of any peak or glacier, it must be seen in at least two (or preferably three) different kinds of

¹ 18×24 cm.

ight. Early morning and late evening shadows reveal all sorts of undulations, cracks and minor buttresses that don't show up at all in the full glare of noonday. However, careful study of the flat, uninteresting pictures taken at high noon will often yield a wealth of information about the quality of rock and snow, as well as facts about small topographic features, which always seem to be lost in early or late shadows.

Advance planning of these flights has been great fun—plotting the ideal times and weather conditions to give the greatest amount of information. Often, for example, in studying a great rock face, it is better to photograph it in direct sun immediately after a light fall of dry snow than to work with cross-light and shadow when the peak is snowless and in good climbing condition—for the dark shadows in the cracks and chimneys may not show up well against the rocks, and a fall of wet sticky snow plasters the whole face with a uniform meaningless white. But the light snow, fallen with no wind, collects on all the ledges, platforms and cracks, revealing an infinitude of important detail hidden at all other times. Aerial photography of this sort is a pleasant blending of art, science and detective work, which has always made it a stimulating and absorbing pastime for me.

For a long time I have yearned to get back and see the Alps, among which I had so many wonderful experiences thirty-odd years ago. I was not only eager to see old friends and beautiful valleys, but I wanted particularly to photograph Mont Blanc, the Aiguilles, the Matterhorn and the Bernese Oberland from the air—and to enjoy them at twilight, at dawn, in clear weather and in storm with the full intimacy that one can only have with a tiny airplane and an extremely competent pilot.

This opportunity came in 1957 and 1958 when I visited Europe with my wife and son to study a number of Science Museums and Aquariums, and to work with the Swiss Foundation for Alpine Research on final plans for the publication of our map of Mt. McKinley.

The excellent little airport at Sion in the Rhone Valley made an ideal base for my flights, as all three of the areas in which I was interested were within easy half-hour flying distance and (unlike Alaska) one could usually telephone to Zermatt, Chamonix or Mürren and know in advance exactly what weather to expect! Hermann Geiger's Piper "Super Cub 150" airplane on ski-wheels was the same kind that I had used for years in Alaska and learned to like and trust so much. And Herr Geiger and his experienced pilots not only were intimately familiar with mountain flying but knew every inch of this country well.

In all, I made about a dozen short flights, always flying with either Jack Stutz or Fernand Martignoni. I never left the ground with Herr Geiger, because he was always so deeply involved in emergency rescue work at the time I was there. However, I could not have had better piloting than his two patient and able assistants did for me—and there is nothing more important than a good pilot for the well-nigh acrobatic flying often required in getting closeup views of peaks like the ones we studied.

These flights and the taking of these pictures were a thrilling experience for me, and it is a privilege to publish some of them and to be asked to write these few words about them for *The Mountain World*.

POBEDA PEAK

By Witaly Abalakov and Wladimir Kizel

HISTORY OF THE MOUNTAIN

Pobeda Peak (7439 m) in the Kokshaltau Range of the Tien Shan, which was finally conquered in 1956 after many unsuccessful assaults, may rightly be called "a peak with a history".

Bhuddist pilgrims and merchants who traversed the passes and valleys of the Tien Shan many centuries ago, and even travellers like Merzbacher, Borghese and Almashy, who are closer to us in time, were quite certain that Khan Tengri (6995 m) was the highest point in the whole of the Tien Shan. For many centuries, apparently, the aura of inaccessibility which hovered over the "Lord of the Sky" (the Chinese name for Khan Tengri) prevented experienced mountaineers from seeing another peak to the south of Khan Tengri.

But after the first ascent of Khan Tengri (in 1931, by a group led by M. Pogrebetsky), the brothers V. and E. Abalakov, who climbed the summit in 1936, and particularly Professor A. Letavet, who reached it in 1937, expressed their conviction that they had seen another peak to the south, which "might be higher than Khan Tengri".

In 1938, the Letavet expedition, after crossing the Southern Inylchek Glacier, continued along a tributary glacier which bears the happy name of "Little Star". The view from the camp was of a mighty, snowy wall. Somewhere there must be the peak which Soviet climbers had seen from the summit of Khan Tengri, and from Nansen and Constitution Peaks!

The expedition was depleted even before the assault began. One member fell into a crevasse and others fell ill. There were only three left to undertake the assault—L. Gutman, E. Ivanov and A. Sidorenko.

The route, as was expected, was difficult. Worn out and suffering from frostbite, the climbers finally reached the mist-enclouded crest. The altimeter showed 6930 m. The climbers thought the point they had reached was the

summit. In the mounting bad weather and with increasing frostbite and fatigue they were unable to continue their route to the crest.

Five years were to pass before the geodesist P. Rapasov—who was working out the results of a new topographical survey of the Tien Shan—was able to establish that there was a peak in the Kokshaltau Range which was almost half a kilometre higher than Khan Tengri. Its height was 7439 m—the most northerly peak in the world exceeding 7000 m.

And so, in Gogol Street, Tashkent—where Rapasov was calculating the results of the survey—a “new” peak was discovered, the second highest in the Soviet Union. It was named by a word which was very much in the forefront of the minds of Soviet people during the war—Victory Peak (Peak Pobeda).¹

But success eluded for some time those who attempted to scale its summit.

In 1949, avalanches forced members of an assault group to turn back after reaching a height of 6000 m.

In 1955, a storm forced members of an expedition organised by the Kazakh Club to retire after reaching a height of 6800 m. Their tents were engulfed by snow, and the assault of Peak Pobeda was unsuccessful.

THE CONQUERORS

... It was an exceptionally difficult day. We arose early in the morning, loaded up our 60 horses, which had spent the night beside us, and passed long hours negotiating the Great Inylchek Glacier; the horses had to jump over crevasses, we had to clear a way over moraines, and still there was more ice! The horses slipped and fell frequently into crevasses. We pulled, dragged, pushed and drove them, urged them up the icy slopes with our shoulders, hauled them out of crevasses with our hands and drove them forward. We had already been three days on the 60 km long Inylchek Glacier...

That year the glacier was particularly rugged; clearly we would not manage to reach the foot of “our” mountain. We would have to establish a base camp on the ice itself. The unloaded horses descended rapidly to the green pastures of the foothills. We were to remain for two months on the ice, alone with the mighty mountain chain of Kokshaltau.

¹ The story of the conquest of Victory Peak has been described in an article published in French, German and English by the Foreign Languages Publishing House, Moscow.

All that remained of the day we spent in setting up camp; we moved and sorted out three tons of equipment, set up store houses, cleared areas in the ice for tents, erected a radio-mast and a club-tent. Our cook, who had spent his forty years in the apple orchards of Prijevalsk, eyed with some doubt his future equipment—a portable gas cooker. It had already been set up between two crevasses from which from time to time there were ominous creakings which seemed to echo the noise of avalanches from the neighbouring slopes. But our Andrei turned out to be a man of courage. Still not accustomed to a height of 4000 m, exhausted from the journey and weary of experienced mountaineers, he immediately set about preparing hot pancakes with a delicious aroma.

Unfortunately, we did not do them honour. At supper, at eleven in the evening, we felt so exhausted that we were eating almost mechanically. With heavy steps we made for our tents—but stopped suddenly in astonishment. For the whole of that and the previous day, low grey clouds had hung over us and the stony foothills had obliterated the view. Anyway, there had been no time to look around during the six days of the caravan route, difficult crossings and rocky passes.

And now, all of a sudden, the clouds had cleared. Tired and indifferent as we were, the view which unfolded before our eyes rivetted our attention. Directly in front of us, with the moon behind it, was one of the most beautiful mountains in the world—the austere white pyramid of Khan Tengri, “Lord of the Sky”. Its icy mass and marble walls shone coldly in the light of the moon; we could see its reflection on the slopes of the Inylchek Glacier. Other peaks extended to left and right, but it was difficult to tear one’s eyes from the pyramid itself, silent and proud and simple in outline, rising over the vast and mighty glacier. For a long time we stood and gazed in silence, until tiredness overwhelmed us.

Next morning, nothing could hold us back; we were anxious to come to grips with “our” peak. It was only visible from the middle of the glacier, and without looking at the sunrise or waiting for breakfast we hastened off in that direction.

And there it was! What we had seen dozens of times in photographs was now there *in vivo*. This was no peak like Khan Tengri, which rose lightly and soared in beauty into the sky; this was something born of the earth, so massive, mighty and craggy that you could not even feel its great height. Anyway, there was no time for the poetry of Goethe or thoughts of Roerich. We were on the alert, like hounds sensing the presence of quarry, and we were searching for a possible route with the practised eyes of climbers. For us the beautiful clouds of powdered

snow waving over the crest were only an indication of the wind force we would have to cope with, and the delicate whiteness of the slopes but an indication of the depth of the snow which we would have to trudge through. Should we then adopt the motto of the Vikings—"The outcome depends on fate, but valour is your affair"? No, no... the outcome would have to be our affair too!

With our eyes glued on the summit we made our preliminary assessments. The height, by modern scales, was not particularly great, nor were there any real technical difficulties; the most northerly peak in the world higher than 7000 m was not dangerous in this sense—the real danger was weather, snow and wind. On the average there were about six or seven fine days a month here, but a yellowish mist was liable to move suddenly into the ravine, and this was the harbinger of another snowstorm within the hour. We had already sensed how much colder it was here than in the Pamirs, which we knew.

Wrapped in thought, we made our way slowly back to camp.

Two days later, and we were off on our first venture. Our objectives were not spectacular; we were to advance to the foot of the peak and "get the feel of it", have a look at the condition of the snow and at everything else which a climber examines when he comes face to face with a mountain; at the same time we would bring the first lot of supplies up to the foot of the peak and put in some practice.

One after another we left camp—the first steps on the first day. And how many more were still ahead of us! For a long time, years in fact, we had been preparing for this moment. The final stage of preparation had been a twelve-day camp on the shores of the fabulous high-mountain lake Issyk-Kul, where, by running, swimming and gymnastics, we shook off what remained of our urban tiredness; after all, there were no professional mountaineers among us, and all of us—fitters, scientific workers, engineers, sculptors, metal workers and miners—had been working fairly hard all year.

One after another we left camp. "We" being a team of the "Spartak" sports society and, *vanitum vanitatis*, we are proud of our team. It is the oldest climbing club in the country, and will be ten years old next winter, with its basic membership unchanged. Dozens of young climbers have "graduated" from our "school" and, after "acclimatization", have either remained in the team or found their own "climbing legs".

In front was the team captain—Witaly Abalakov. Behind him were the old-timers—*les vieux grognards*—Arkin, Anufrikov, Borovikov, Gusak, Kizel and Leonov, followed by Budanov—a fitter from Leningrad who became a fully

fledged member of the team last year. Laughing under their heavy rucksacks came the 23-year-old Kletsko and his young friends Tur and Arganovsky, and, at an easy measured pace, Ural Usenov, a courageous Kazakh who had seen much in his time. He was a sailor and timber-man, had taken part in two previously unsuccessful attempts (1949 and 1955) and was "determined" to get to the top. Then there was his fellow countryman Musaev, a miner; both were members of the Kazakh mountaineering club, like Avdeev and Kelter behind them.

THE MOUNTAIN'S CHALLENGE

It was clearly going to be a struggle with no holds barred. The mountain very soon showed us what it was capable of. As soon as we arrived at what was to be the site of "Camp 4700", it began to snow. It continued for the rest of the day and piled higher and higher. That night we had to crawl out of our tents to shake off the heavy accumulation of snow. By morning, more than a metre had fallen. The fall kept increasing and the whole camp was like a system of slit trenches; the second night, too, was spent in this battle. Next morning we realized that we wouldn't even be able to see the mist-enclouded summit, and we would have to go down. We left only two behind—Abalakov and Nikolai Gusak, who had climbed Stalin Peak in 1937.

It was August 19th. Preparations had been completed. "Camp 4700" had been equipped at the foot of the mountain, and large "caves" capable of holding 15 men had been dug out at 5300 m, on top of the vast snow plateau at 5800 m, at the beginning of the buttress where our route took us, and at 6200 m, in front of the ice faults on the slope. Provisions, fuel and necessary equipment had been stored in the "caves".

We had rested. Now for the assault! A great deal of thought had been given to organization and the composition of the assault group. All those who were in first-rate condition—eleven men—would go on. In the event of any *force majeure* this would be a stand-by; a large group could extricate itself from any situation. Such numbers, of course, complicate the organization of an assault to a certain extent (like all Soviet climbers we dispense with porters), and impair movement, particularly in dangerous avalanche areas; but team work is much more important to us than breaking records with somebody else's help. This technique is nothing new for us. In groups of eight or nine we have attacked the northern face of Dykh-Tau (an 8-day climb), which for us was the emotional

culmination of all our climbing experience, and the face of Shurovsky Peak, Ullu-Tau-Khan and Shkhelda. In the same way we tackled the 6000-m face of Muszhilga-Sandal, which took us 14 days, the Bezingi Face, and Koshtan-Tau—Dykh-Tau. Here, too, our group, closely knit and tied by long and firm friendships, was a real striking force.

We could rightly use the inscription on the ancient banner, "Victory through Unity".

But on this occasion there were two missing from our team. Because of illness, Anufrikov—whose absence as a first-class climber and photographer was a great loss—and Borovikov, a cool and determined climber who could always be relied upon to give clear and logical advice in any difficult situation, had to stay below. Borovikov was one of the "brains trust" of our team, as well as being an experienced mountain meteorologist.

THE ASSAULT

We were moving at last! The reconnaissance had already been carried out by Abalakov on the 18th. Gusak started moving, followed by Filimonov—a broad-shouldered giant, stubborn, silent, reliable and determined, who, because of this and his blond flaxen hair, was nick-named "the white silence". Then Budanov—an energetic organizer and amateur cook, tough, fast and active.

On the 19th the rest moved off, led by Kizel. Then Arkin and Leonov—a gymnastic instructor who had emerged as a climber in 1938, when the Bezingi Face was climbed for the first time. Behind them were Usenov, Musaev, the Muscovite sculptor Tur, and Kletsko. They were accompanied up to "Camp 5300" by Anufrikov, Arganovsky, Kelter and Blyakhman.

On the way there was an unexpected fifth member—Abrek, the dog. He had joined our expedition somewhere beyond Prjevalsk, where, our young men innocently asserted, he had "stuck" to us. At the glacier camp he had enjoyed a "full" life and had a warm place among the sleeping bags. How he ever managed to negotiate the labyrinth of fissures is anybody's guess, but there he was at the start of the ascent of the slope, and despite all our efforts to chase him off he made his way with much determination through the sharp, deep snow to "Camp 5300". The only thing which forced him to retire below was the light, which was too bright for him; he never thought of asking for a pair of snow-glasses.

On the 20th the assault group was moving higher. The going was difficult; there had recently been a heavy snowfall and now there was a strong upwind which piled up thick snow ridges, covered the steps we had cut in the ice slopes and even our guide ropes. All tracks which we had marked out during the previous day's reconnaissance had been obliterated by the snow. It was as though the mountain was anxious to cover up and remove all the traces we had made upon it. We remembered the words of the "experts" of the district: "Above 5500 m the wind never stops blowing."

Having traversed the difficult ice slope, we encountered rocks buried under light powdery snow, on which we found it very difficult to keep our feet. The treacherous Tien Shan weather changed for the worst; we made our way over the rocks and through the deep snow, at times up to waist and chest level. Our tactical plan, however, was proving correct; there was "Cave 5800", and we would be able to have a meal in warmth and comfort on the provisions we had stored there. That night, outside the thin walls of our "cave", there was a blizzard...

In the morning it had abated; it was possible to go outside, but the wind and the cold—normal for any climb in the Tien Shan—were not to leave us until we had completed the ascent. In "Cave 6200" the whole group was gathered together. The primus stoves were roaring away at both ends of the "cave"—a kind of desperate emulation between two cooks. This, alas! was to go on for the whole of the next day; the storm was rising again. We wouldn't be able to continue the ascent until the 23rd.

Abalakov, Gusak and Kizel (because of Anufrikov's illness he became cameraman) went up to reconnoitre; the rest of us descended, because during that day we had to bring up further supplies from "Camp 5800", along the snowy crest of the buttress. By evening the weather worsened; there was another snowstorm and more snow drifts. The snow was beating in our faces as we climbed along the crest with our heavy loads.

So we stayed out for another day. We still couldn't move—not even to satisfy nature. Even to crawl out of the "cave" was becoming a problem.

On the 25th we all moved up. Some stayed to dig out a "cave" at 6500 m, while others "dropped" down to 6200 to bring up another 120 kg of supplies.

August 26th turned out to be a clear day and we felt we had to get higher as quickly as possible. Up there, where the buttress touched the slope, the overhangs were waiting for us; but they didn't turn out to be so fearful as they seemed from below. Higher up still, the snow was firmer. At 7000 m we threw off our

rucksacks and began digging out a "cave". From here Khan Tengri—the mighty Khan Tengri itself—was already somewhat below us and losing some of its greatness. But the Tien Shan had by no means given in; the storm was brewing. At midday the ravine was again beginning to fill up with an evil, yellow mist, which had crept in from the bleak deserts of Central Asia; there was bad weather on the way.

Without having time to complete our preparations, we were obliged to hasten down to "Cave 6500", where there were considerable supplies of food, because we were ravenously hungry despite the altitude. For us it was a refuge and the most comfortable spot on the whole of the harsh Tien Shan. Abalakov caught up with the group on the way down; he and Gusak had traversed a very nasty ridge of rocks in the course of their reconnaissance. As he put it: "It wasn't as bad as it looked."

No sooner had we got down when we had a radio report from below that bad weather was expected on August 27th and 28th (we had been receiving regular weather forecasts from meteorologists in Alma-Ata, which had always turned out to be correct). But this triumph of science hardly brought us any comfort; there would be a blizzard for two days!

Above us the light played on the roof of our "cave", now dark, now light, and we could sense the waves of snow tumbling over us from the slope above and being whipped away again by the wind.

Our small volume of short stories by O'Henry had been read from cover to cover, but, given eleven friends—all experienced climbers—there was never a dull moment. What with jokes, spicy stories and reminiscences, our *Hexameron* would have been voluminous. Arkin would have figured quite prominently in it. In the trickiest of situations he would come out with some wisecrack, and every misfortune was met with good humour; he had been like that during the war and in all expeditions by our team. Even now, despite his 44 years—26 of which had been connected with mountaineering—he was one of the toughest among us.

On August 29th we were at last able to move up. By 14.00 hours we were at "Cave 7000", and two hours later, having made our shelter, we were snug in our bags. The cookers were roaring away and the amount of food in evidence was formidable; our usually strict chef had issued a pronouncement hitherto unheard during the climb: "You can eat anything you like and as much as you like!" There was continuous emulation between the cooks; the delicious omelette served up by Budanov was followed by chicken cutlets from the "firm" of Kletsko.

But despite the heightened sense of comfort and well-being, the atmosphere in the "cave" that day was somehow permeated with a certain uneasiness. The assault was to be tomorrow. Each one of us involuntarily retired into himself, and we were preparing ourselves as soldiers do before a battle.

Next day was sunny, there were the usual snowdrifts and the temperature was minus 25°. In fact everything was fine and we could be off. The pensiveness of the evening before had gone, and it was time to make a start. So we moved off with our eyes rivetted on the summit. Abalakov and Gusak led off, followed by the rest. The group was lightly equipped except for Arkin, who was carrying the photographic equipment which Kizel was to use on the top.

We crossed the first ridge of rocks. Occasionally losing sight of each other in the thick driving snow and leaning into the wind, our lines became longer and we were tiny black figures against the whiteness of the snowy whirlwind.

The slope was blustery and the snow surface firm and hard; we crawled over the second ridge of rocks. We were dressed in furlined suits, the thickest of sweaters and wind jackets—not quite the ideal garments for crawling over rocks and cliffs, particularly at an altitude of almost 8000 m.

The sun was shining and the weather was bright; we knew that away down below, in the bottomless distance, from a barely visible platform our comrades would be watching us. They were probably counting the tiny black specks on the vast slope and trying to work out who was who. And probably our faithful Borovikov was casting an anxious eye at the horizon to see if there was any bad weather brewing. That would just about cap it.

The steepness of the slope was increasing, and those in front were negotiating the ledge. Then there was the crest. In front of us was "the coldness of beautiful distant glaciers" and the snows of the Chinese Tien Shan. Khan Tengri looked rather small and a long way down. Below and behind us were weeks of climbing and months of preparation. The final moments were approaching. And there, now—the first of our party was on the summit. One more rope up and the red "Spartak" flag was fluttering over our weary, shapeless little figures.

Two years later, in 1958, Pobeda Peak was again conquered by an expedition of sportsmen from the "Bauman" Higher Technical College in Moscow and Moscow University.

RAKAPOSHI

BRITISH-PAKISTANI FORCES EXPEDITION 1958

By Tom W. Patey

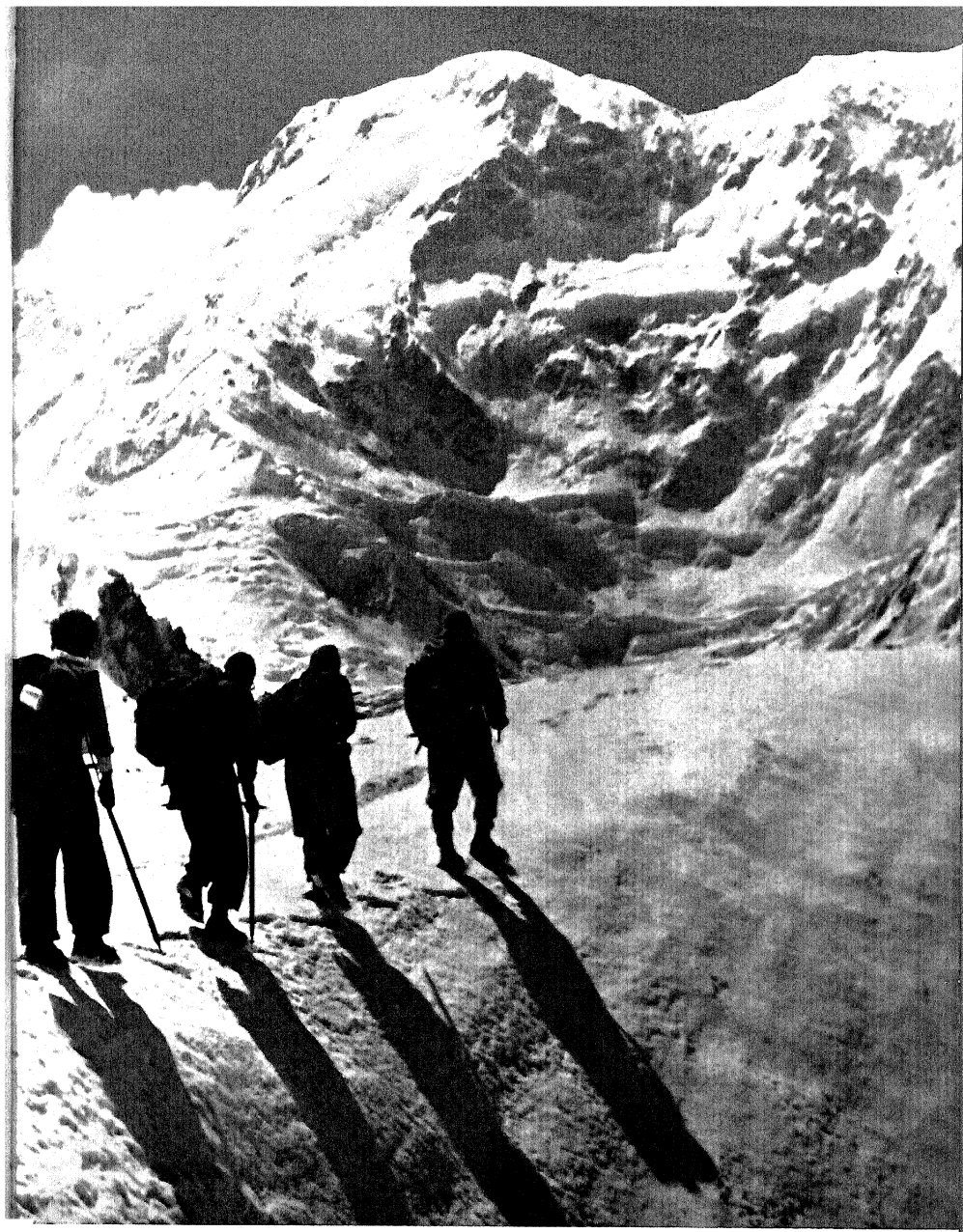
No one could describe Rakaposhi as a friendly mountain. It is a tempestuous Himalayan virgin and flatters only to deceive. Although, as Mike Banks remarked pointedly, "It hasn't claimed a victim yet", it has at least made a creditable attempt. On the last three expeditions there have been fourteen falls, and unwelcome suitors have had to run the gauntlet of avalanches, collapsing cornices and an electric storm. Obviously its courtship should be conducted with resolute firmness...

Curiously enough the 1958 British-Pakistani Forces Expedition selected Rakaposhi as a safer alternative to their original choice of Disteghil Sar. Banks, our leader, had a say in the matter, for he had led the 1956 Rakaposhi attempt when a combined British-American four man expedition (B.A.K.E.) failed only 1500 ft. from the top (25,550 ft.). He attributed their failure to bad weather, lack of manpower and the inability of the porters to carry beyond Camp II at 19,000 ft. Another factor, perhaps not insignificant, was the fact that all the participants, liaison officer and porters included, had fallen at least 100 ft. at some time in the course of the expedition! The American, Bob Swift, collected the laurels here: he had been charged during an electric storm on the Monk's Head and taken two weeks to recover!

The first name to be associated with Rakaposhi was that of Martin Conway, doyen of Himalayan explorers, who in 1892 pronounced the mountain "quite climbable if the upper part of the south-west ridge can be reached". Yet it was not until 1938 that Vivyan and Secord, employing rush tactics, climbed a 19,750-ft. peak on the north-west ridge within a week of leaving Gilgit. Here a deep gap, impassable to porters, prevented further progress. After the war Secord returned to the attack with Tilman and two Swiss climbers, Gyr¹ and Kappeler. They gained the north-west ridge beyond the impasse, but again it was not a route for laden porters.

The same party were the first to put Conway's theory to the test. They

¹ *Berge der Welt* 1947, p. 115 ff.

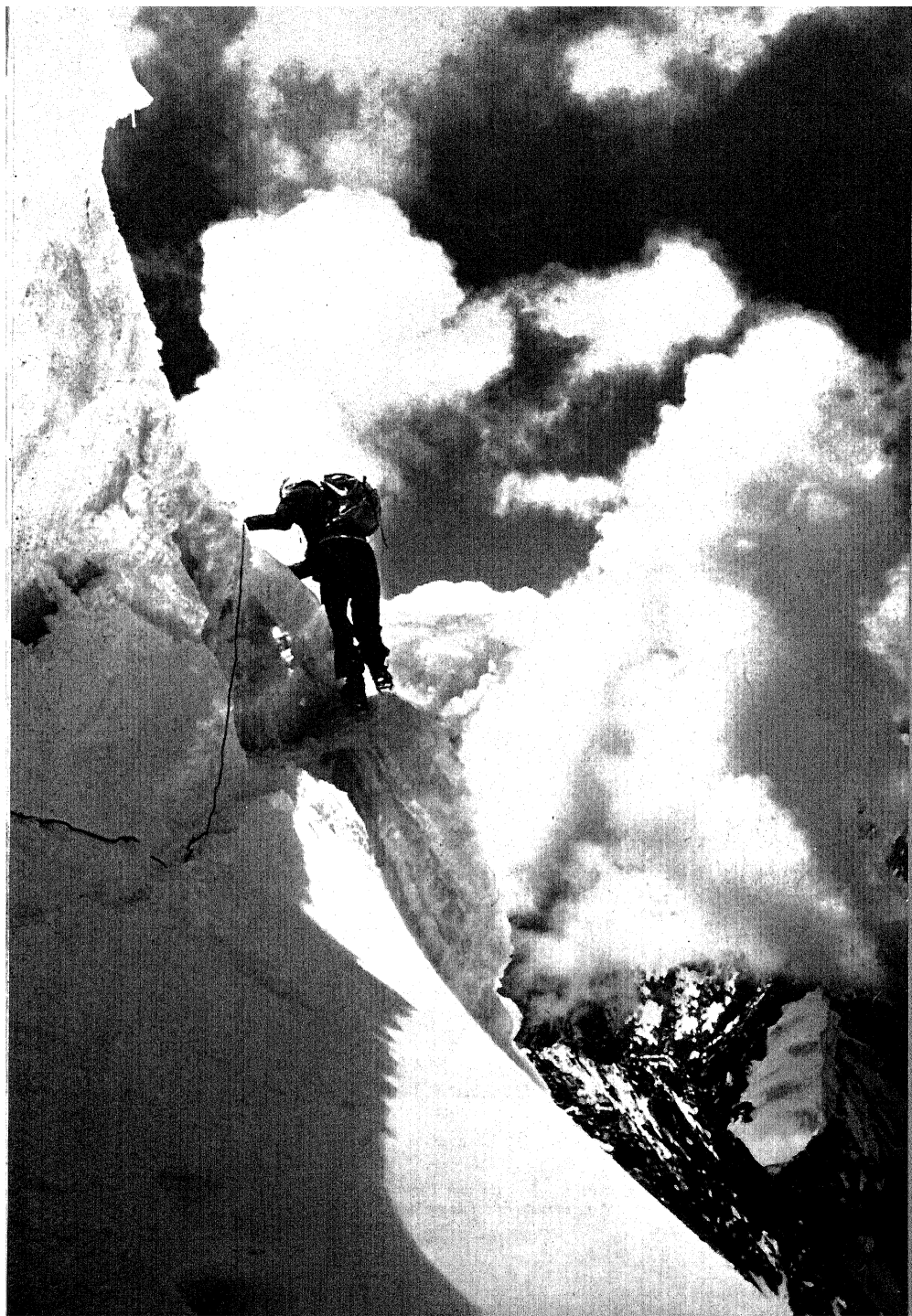


14 THE ICY HEIGHTS OF PEAK POBEDA (24,548 ft.) in the Tien-Shan range, Central Asia. First ascended by a Russian expedition in 1956, after numerous previous attempts had failed. (Photograph by M. Anufrikov)



15 MONK'S HEAD (21,120 ft.) on Rakaposhi, North-West Karakoram. (Photograph by R. Irvin)

16 overleaf: ASCENDING the south-west spur of Rakaposhi. (Photograph by Mike Banks)





17 RAKAUPHI (25,550 ft.) with Biro icefall seen from the west. First ascent by a British-Pakistani expedition 1958. In the right upper corner the Monk's Head. (Photograph by Mike Banks)

attacked the south-west spur, the obvious stairway to those alluring upper slopes of the south-west ridge. (See diagram.) The spur presented problems of no mean order, perhaps outside the scope of pre-war mountaineering in the Himalayas. From the first subsidiary peak of 19,000 ft. the crest of the spur, heavily corniced to the north, ran back on an undulating course for $1\frac{1}{2}$ miles with little net gain in height before merging into the face below the feature known now as the Monk's Head. Half-way along this ridge Tilman came to a halt at the top of a razor-edged blade of snow, the Gendarme, and was moved to utter famous words cherished by subsequent expeditions, "Hopeless, hopeless". He referred to the 1000-ft. ice slope of the Monk's Head which confronted him and barred the way on to the south-west ridge at 21,000 ft.

The dossier would not be complete without including the summary of the strong Austro-German Expedition of 1954, among their numbers Heckmair and Rebutsch: "The mountain appeared unclimbable by any of the routes we prospected." A debonair Cambridge undergraduate party followed hard on the heels of the Germans. Their adventures are described by George Band in his book, *Road to Rakaposhi*. They quickly realised that the south-west spur was the only feasible route and, although hampered by unwilling porters and Wrangham's temporary departure through a cornice, they succeeded in forcing a route up the face of the Monk's Head. Band described this as his "finest day's climbing in the Himalayas". The door to the inner sanctuary was open.

In the summer of 1956 came the four B.A.K.E. stalwarts—Banks, McInnes, Swift and Irvin. Hamish McInnes, a spartan Scot, was put in charge of food supplies, with dire results. His final letter from New Zealand advised them "to prepare to live like peasants". Nevertheless they succeeded in roping the Monk's Head and establishing two camps above this on the south-west ridge. From their top camp at 23,000 ft. they made their summit bid, but mediocre conditions forced them to give up after climbing only 500 ft.

A few lessons had been learned. Three camps were necessary above the Monk's Head. Banks was convinced that their top camp was too low to launch a successful summit attempt. For maximum safety six men must be firmly established above the Monk's Head, a summit pair and supporting parties at the other two camps. To achieve this the porters would be required to carry at least to the top of the Monk's Head and this would only be practicable after 4000 ft. of fixed rope had been installed. Thus Rakaposhi, although not enjoying the exalted status of a Dyhrenfurth "Achttausender", promised to offer problems of organisation and transport quite equal to those encountered on the greater peaks.

The story of the successful Joint Services Expedition to Rakaposhi started as the germ of an idea in the minds of two army Officers, sometime in 1956. These two, Captain Warwick Deacock, S.A.S., and Captain E. J. E. Mills, R.A.S.C., decided to attempt to scale a major peak in the Himalayas. During the initial planning, Captain Banks, Royal Marines, was invited to lead the Expedition. Official support from Field-Marshal Sir Gerald Templar, who became joint patron with General Ayub Khan, Commander-in-Chief of the Pakistan Army, eased administrative worries. A committee under Major-General J. L. Moulton, Chief of Amphibious Warfare, was set up. Problems of equipment, food and finance were slowly sorted out.

Most of the team of nine had previous expedition experience. Mills and Deacock had been in the Army expedition to Alaska; John Sims had visited the Lahoul Himalaya with the R.A.F. team in 1955; Richard Brooke joined us direct from a winter in the Arctic with Hillary's party. (With another expedition to the Arctic to his credit he perhaps holds a unique record.) Banks had considerable Arctic experience and of course had led the 1956 Rakaposhi bid, while I had already visited the Karakoram with the Mustagh Tower party. Dickie Grant, a Commando climbing instructor, joined us as a last minute substitute for Lesten Davies. The two Pakistani members were Raja Aslam and Shah Khan, and upon the latter the success of our expedition hinged. He was the uncle of the Mir of Hunza and his presence was likely to inspire the Hunza porters with a sense of urgency! Brooke and Sims were survey officers, and the Survey of Pakistan had supplied us with Sahib Shah, a veteran of several expeditions. I envied the three of them their task, as the area had already been mapped several times. My own appointment as physiologist was an unpopular one—with my fellow climbers and myself. On May 12th the expedition left Gilgit. Rakaposhi is perhaps the most accessible of the greater Himalayan peaks with an approach march of a mere three days from Gilgit if jeeps are hired for the initial 16-mile drive up the Hunza Gorge. Unfortunately we were held up the best part of a week at 10,000 ft. by heavy snowfall, which discouraged our poorly shod coolies. It had been an exceptionally severe winter and Banks reckoned that conditions higher up would be equivalent to those of late March in an average season.

Base Camp on a lateral moraine of the Kunti Glacier occupied the same site as that used by the three post-war British expeditions. Our main party settled in on May 20th, but Banks and I meanwhile pushed head to reconnoitre a possible short cut on to the south-west spur, which would avoid the long traverse over the first 19,000-ft. peak and bring us to the crest not far below the Gendarme.

Here we would establish Camp II at the site of the Cambridge Camp IV, a substantial gain.

We reached a height of 17,400 ft. on the first day, and erected Camp I on a minor shoulder abutting against the main face. Much labour was expected on digging in to the 45-degree slope, where perhaps a snow-hole would have been more satisfactory in the long run.

The rest of our projected route looked quite feasible, but more heavy snowfall enforced retreat. We felt sufficiently confident, however, to give the "go ahead" to stage one on the expedition schedule. This consisted of ferrying 40 man-loads up the 3000 ft. of steep snow below the camp: in the steep gully leading up to the shoulder we fixed the first thousand feet of rope to safeguard our porters. Soon everyone (including a few halfhearted Jagloti auxiliaries who had been enticed by the promise of a pair of boots) was engaged on this thankless task, and the language was hot enough to melt the virgin snow.

Every evening it snowed. The previous day's tracks were invariably obliterated by morning, and the dreary routine of breaking trail, often thigh deep, had to begin again. The riotous evenings at base with my accordion and a vigorous percussion section led by Grant did much to relieve the monotony. They were also responsible for the premature broaching of the crate of whisky with which we had intended to celebrate our success on the mountain.

A day came when Rakaposhi decided to show her mettle. Richard Brooke, always an excellent companion on an ice climb, had accompanied me on a reconnaissance of the next stage of the route, the 1200-ft. face leading up from Camp I to the crest of the south-west spur. For once it was a glorious day and our spirits rose as we climbed. Great ice slopes fell away to lose themselves in the depths of the Kunti Glacier, 4000 ft. below. At 11.30 a.m. I was only 200 ft. from the crest. The snow was excellent for kicking steps with a firm surface crust. Suddenly a shout broke the stillness. "I say, I'm certain I felt the slope move just now." I made a mental note for the physiological diary: "Brooke, hallucinations, not yet fully acclimatised."

His next shout, seconds later, was drowned in a dull roar as the whole slope avalanched. An area about the size of a football field broke away above and below us. At the instant we felt ourselves moving we drove our axes firmly into the stable underlying névé and hung on grimly. A tremendous weight of snow piled up against my body, but just as the pressure became unbearable I managed to deflect it past me with a mighty heave. The crisis was all over in ten seconds, and perhaps a minute later we saw the debris spill out on the lower slope 2000 ft. below.

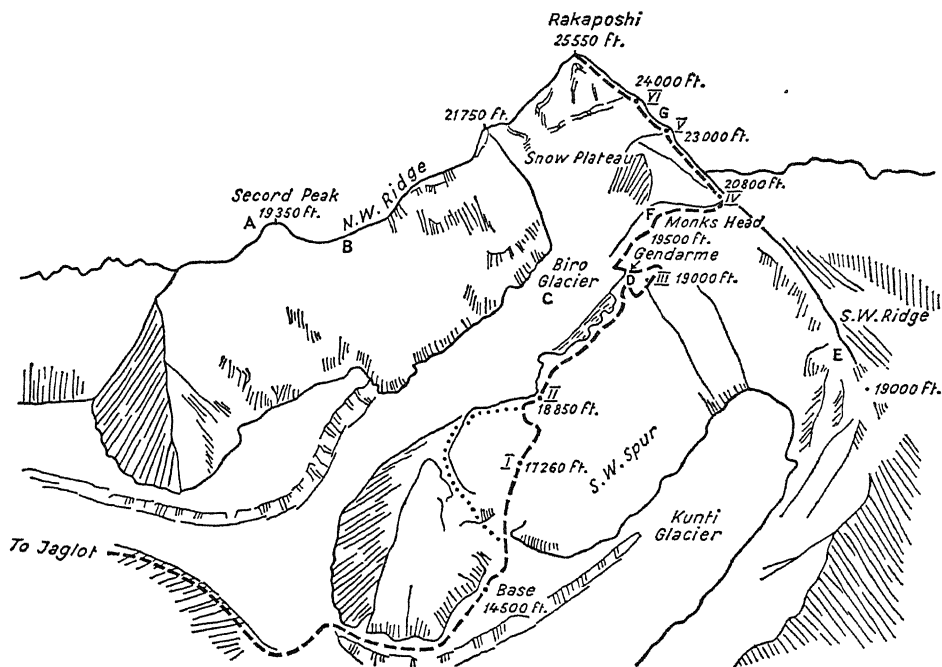
The silence was broken by Richard, picking his words deliberately with an admirable display of "sang-froid" as befits an Alpine Club member. "This place is distinctly dangerous. I propose that we turn back." This time I needed no persuasion and promptly abandoned my ice-axe which had fortunately lodged in the slope by its pick. The two of us were stunned by the incident. This was giant windslab on a scale beyond our experience. Indeed, despite similar episodes of a less serious nature later on, I still regard myself as quite unable to forecast the stability of Rakaposhi snow. The snow that day was the firmest we had met on the mountain!

More was to follow. A few days later another blizzard forced us all down to Base Camp. At the height of the storm Shah Khan, Raja and the porters sallied forth from Camp I intent upon a rapid descent to Base Camp. It was, in fact, considerably faster than they had anticipated. Without warning a huge powder snow avalanche swept out of the mist, picked them up effortlessly and deposited them 1000 ft. nearer Base Camp. They were unharmed but minus most of their kit and quite euphoric. Our initial enthusiasm had lost much of its sparkle, and the porters were beginning to develop strange illnesses.

A week later we returned to the scene of the first avalanche to find that the snow above the cleavage line was still in a highly precarious condition. Belayed by the others I went up the last 100 ft. like an ibex. Once we had all assembled on the crest, Brooke and I descended on a tight rope and with a jump sent another huge mass of snow plunging down the face. This time most of the route above Camp I was cleaned of debris, and with the addition of another 1000 ft. of fixed rope the way was open for the next lift. Camp II went up a short distance along the ridge, within easy striking distance of the razor-backed Gendarme which reared up steeply for 400 ft.

For several days I was detained at Base Camp looking after Raja Aslam, who had developed a recurrence of his malaria. During this time John Sims was performing heroics leading the Gendarme in waist-deep powder snow. Both sides had to be roped, for the steep slope on the far side could be a death trap to a tired party retreating in a blizzard. When I joined Brooke and Grant at Camp I we were able to leapfrog the top party and proceed to establish Camp III below the Monk's Head. On the mile of ridge beyond Camp II there is no net gain in height, and despite all our hard work we were only a little over 19,000 ft.

Still the bad weather persisted. One night a violent thunderstorm hit us at Camp III and vivid flashes of lightning illuminated the interior of the tent. The mornings were usually fine and found the three of us hard at work on the



Rakaposhi from SW (NW Karakoram). Route of the British-Pakistani Forces Expedition 1958 (By Sabib Shah, Survey of Pakistan). A = Secord and Vyryan 1938 (19,350 ft.). B = Gyr and Tilman 1947 (19,000 ft.). C = Tilman and one sherpa 1947 (16,000 ft.). D = Tilman and others 1947 (19,000 ft.). E = Austrian-German Expedition 1954 (17,000 ft.). F = Band, Fisher, Tissières 1954 (20,800 ft.). G = Banks, McInnes, Irvine and Swift 1956 (23,000 ft.).

"Rakaposhi treadmill". We attacked the 1000-ft., 45-degree slope of the Monk's Head, as did our predecessors, by the left edge next to the abyss of the Biro Glacier. Every 100 ft. we left a great hole in the snow where a piton had been planted deep in the ice substratum. Near the top, where the angle steepened slightly, Warwick Deacock's long aluminium stakes proved invaluable for anchoring the ropes.

After three day's work the route was completed and the summit plan could go into operation. The first stage was a single combined lift by all members and porters to the top of the Monk's Head at 21,000 ft. Only Shah Khan remained at Camp III, suffering from altitude headache.

The Monk's Head belied its reputation for difficulty—it was no harder than the north face of the Plan in the Chamonix Aiguilles—and the porters justified their selection by making short work of the face, although aided throughout by fixed

rope. They had climbed farther than their fellow Hunzas on the earlier expeditions, and much of the credit was due to Shah Khan. We could now afford to dispense with their services for the last stretch of the route up the south-west ridge. The next day we shifted camp from the top of Monk's Head across half a mile of desolate plateaux to a more satisfactory site below the first of the three great steps of the upper ridge. With complete lack of foresight we moved all the essential kit including the tents in the first carry, and on the second trip discovered that the driving snow had obliterated our tracks. Visibility was nil and we could only proceed by the feel of the old tracks under the fresh snow. With only one hour of daylight left we found the new site, thus avoiding the bivouac to which our stupidity had nearly condemned us.

On June 23rd the seven of us attacked the first 2000-ft. step. Mills, Deacock and Sims shouldered all the essential equipment for the last two camps: the other four of us carried only our personal kit and were to form the assault team. It was a difficult choice for anybody to make, for each member had acclimatised well and was going sufficiently strongly to reach the top. Indeed, we still hoped that the weather would allow us all to make an attempt.

Above 21,000 ft. the snow had consolidated under the influence of the bitter north-west wind which sweeps the ridge, and the going was immediately easier. Crampons were now a benefit, but we often had to kick steps in the hard snow, as a result of which most of the team were to lose at least one toenail from mild frostbite. At least the avalanche danger was past; we saw no wind slab above the Monk's Head. In the early afternoon we staggered onto a level shoulder above the step, the first available camp site on the upper ridge and the site of the B.A.K.E. Top Camp in 1956. As elsewhere there remained not a trace of their visit, a bitter disappointment as their three camps had been left fully stocked for the second attempt which never materialised.

The support party left us here and we settled down in two man tents to spend a cold but reasonably comfortable night. Even during the day the temperature seldom rises above freezing point on this exposed ridge. Mike and I, benefiting from our experiences in 1956 when we both climbed above 23,000 ft., had acclimatised a little faster than the others and were to make the first bid for the top from the next camp (Camp VI). Richard Brooke and Dick Grant would sleep another two nights at Camp V before moving up to make their attempt.

By so doing they were able to relieve us of all but personal kit on the next day's carry up the second step. A thin spine of shattered rock broke the uniformity of the 1000-ft. face and saved us hours of step cutting. The wind was

strengthening and we often had to shelter in the lee of the boulders to restore circulation. Despite our 40-pound loads we were all four moving well, and in an hour had passed the highest point reached in 1956. Near the top of the face the steepening rocks forced us leftwards onto a 50-degree slope up which Richard battered a ladder of steps. At 1 p.m. we made an abrupt exit from the face onto the broad upper plateaux which straddles the mountain from the north-west ridge to the south-east ridge. Through the drifting snow we could see the rocky summit pyramid shining dimly in the afternoon sun. It looked so near that Grant and I were tempted to carry on. However, it was not long before he and Brooke were prevailed upon by the wind, now almost gale force, to get back to their tent while they could, leaving the two of us at Camp VI.

Mike and I lay awake far into the night, listening to the blizzard raging outside. I estimated our chance of success as very slight as the food supply would allow the two of us only one attempt. We picked at our oatmeal biscuits half-heartedly, consoling our protesting stomachs by calling down the wrath of Allah upon the head of the absent food officer. Jimmy Mills was the next most unpopular man to the physiologist at the high camps. The fact that he had made a scientific study of his subject and condensed the daily quota of calories into a pocket-sized carton earned him none of the credit he anticipated.

We awoke at 6 a.m. on June 25th to the roar of the blizzard. Mike was almost suffocating under the weight of snow piled up against the tent wall. A peep outside to collect snow for making tea revealed an icy inferno which sent a cloud of spindrift billowing into the tent. We ate a leisurely three-hour breakfast: as Mike remarked "There is no need to hurry". Duvets, windproofs, every article of clothing went on. At 9 a.m. I stuck my head out and, with what I hoped was a debonair laugh, said "Here goes". We had only gone a few paces when we realised the sky was quite clear, although this was only a minor consolation as we seldom glimpsed the sun in the driving spindrift. The gale force must have been 60 m.p.h. To face directly into the wind would have been to invite immediate frost bite.

We had 1500 ft. to climb and no technical difficulties to stop us, yet we had to fight for every step. The crampons were in the rucksack but it was far too cold to remove our gloves long enough to strap them on, and so we settled into the mechanical routine of step kicking. For a long time we seemed to get no nearer to the summit rocks, intermittently visible through the snow streamers. Mike was complaining of numb feet and I had to stop several times to massage the life back into my hands.

As we learned later, Brooke and Grant were also fighting the gale in a gallant attempt to make the summit from the lower camp. They had to give up after 500 ft., when they realised the impossible nature of their task. It proved to be the last chance of the success they deserved.

After four hours we were on the shattered rocks of the summit pyramid and moving more confidently. The difficulties were only moderate, but the last 200 ft. of the south-west ridge narrowed to a knife edge with a enormous void on the Hunza side. We used the very crest of the ridge as a hand rail, with the gale threatening every minute to tear us from our holds and toss us over the brink. 20 ft. from the top I found a convenient boulder on which to scratch the initials of the expedition. Mike passed me and at 2 p.m. crouched uncertainly on the summit, a crazy pedestal of loose blocks. I staggered heavily after him, intent on placing my boulder on the very top, and succeeded in bruising my already numb fingers.

Ten minutes were sufficient to snatch a few random snapshots and to bestow our curses on the landscape; ten minutes of shivering misery as a climax to a year's preparations and six weeks of physical drudgery! I felt I could sympathise with the man who wrote "the reason I enjoy climbing is because it is so entirely irrational".

We fled before the gale. The ascent had taken five hours, largely due to the appalling conditions: we regained the tent in ninety minutes. It had collapsed, half buried in the drift. In the process of digging it out I punctured my air mattress with a crampon spike, condemning us both to a miserable night in the remaining air bed. To make matters worse my bruised fingers were now badly frostbitten and Mike had numb feet. Luckily we had with us some anti-frost-bite tablet.

During the night the sky became completely overcast, and in the morning the visibility was only a few yards. We left at the deadline of 12 noon and were lucky to strike a way off the plateaux on our first cast. Near Camp V we were deceived by the mirage of an apparently huge sérac looming through the mist into considering ourselves lost. Banks blew himself hoarse on his whistle without evoking any response from the occupants of the tent. Then the sky cleared momentarily to reveal the camp site 100 yards away, and we realised the futility of our distress signals. The deserted tent lay flat on the snow. Inside was a note from Richard: "11 a.m. Tent roof tore today in a gale. Getting out quickly. Hope to hell you made it."

Two hours of daylight left. Spurred on by the thought of a night in a

crevasse, we unroped and moved together, glissading wherever possible. This was no longer an orderly retreat but a rout: everything was sacrificed for speed. Suddenly shouts came through the mist. Our companions had heard our voices and were coming out to meet us. I was never more thankful to see anyone in my life, even if it was Jimmy Mills behind the cine camera, fired with a Stobart-like enthusiasm. A few minutes later we were tucking into a huge plate of chocolate porridge, the "spécialité de la maison". Then followed the less pleasant intravenous injections for frost bite, an operation complicated by Banks dropping the candle. Finally the sleeping bag and oblivion.

That was virtually the end of a successful campaign which had lasted only five weeks. A few days of inactivity at this altitude leave their mark, and no one was keen on mounting a second assault. In any case the bad weather showed no signs of improving. Forty-eight hours later everybody was back at Base Camp. Camp IV was salvaged by the simple expedient of tossing the tent down the Monk's Head, thereby causing the porters some alarm. They ran all the way to the foot of the base, mistaking the sack for a falling Sahib!

There is little more to add, save that the Hunza apricots are the most luscious fruit known to man, and on our return to the valley we did them full justice.

HARAMOSH

AUSTRIAN HIMALAYA-KARAKORAM EXPEDITION 1958

By Franz Mandl

Introduction

On March 28th the Austrian Himalaya Society sent off an expedition with mountaineering and scientific aims. The mountaineering aim was the first ascent of Haramosh, 24,270 ft., in the West Karakoram. Secondary objectives were the reconnaissance of an ascent of Malubiting (c. 24,450 ft.) and of the Laila (22,810 ft.), the latter in the immediate vicinity of Haramosh.

The scientific group had set itself the task of exploring geographically, ethnologically and zoologically the Haramosh and Khaltaro valleys, two lateral valleys of the Indus, difficult of access, as well as other areas in the Gilgit Agency (Gupis, Tangir, Darel).

Corresponding to the twofold aim of the expedition, the team consisted of four climbers and four scientists. The overall leadership was in the hands of Heinrich Roiss, who was killed on April 29th, 1959, when falling into a glacier crevasse on the north-east ridge of Dhaulagiri. In the scientific team were the university professors Dr. Konrad Wiche (geographer), Dr. Karl Jettmar (ethnologist), and the scientific assistant Dr. Eduard Piffl (zoologist). The doctor, Dr. Rudolf Hammerschlag, himself an experienced climber, looked after the climbing party and also carried out tests on them at different altitudes. Apart from Roiss, the climbers comprised Stefan Pauer, the cameraman, Rudolf Ebner and Dr. Franz Mandl.

The Haramosh Group, with its ice-armoured peaks, one of the most impressive in the Saltoro Karakoram, lies between the Indus and the Chogo Lungma Glacier. Three expeditions had occupied themselves with this area in recent years: in 1947 the Swiss, R. Kappeler and H. Gyr, reached a pass (c. 17,700 ft.) at the beginning of the north-east ridge of the Haramosh. In 1955 several members of the Frankfurt Himalaya-Karakoram Expedition, led by Reinhard Sander, had penetrated as far as the Haramosh La (15,912 ft.). Three years later to the day (July 22nd) we found in a cairn above Camp I the tin with the dates, names and addresses of the German group, who in very bad weather and 30 inches of fresh snow had

reached the Haramosh La from the Chogo Lungma Glacier. These expeditions had placed photos at our disposal, and just before our departure we could theoretically fix the supposed route of ascent. The Frankfurters had placed no high hopes in Haramosh. The Swiss group, too, had said little of promise regarding the possibility of a first ascent.¹ The reconnaissance results of both expeditions were of great importance for us; above all, we knew that Haramosh would give us many hard nuts to crack.

The first serious attempt, of which however nothing was known officially until the departure of our group, was made in July 1957 by a five-man expedition from Oxford University under Capt. H. R. A. Streather. The tragic course of this undertaking, which was finally broken off after the death of two members and severe frost bite to a further member, has been vividly described by Ralph Barker.² Johar, one of our Hunza high porters, who had also served the English expedition, did not want to say anything about the enterprise; the fright still seemed to be in his bones.

Approach March through the Indus and Haramosh Valleys

On April 19th our team, together with four tons of baggage, had landed on the airfield at Gilgit (4823 ft.). The air journey from Rawalpindi to Gilgit, lasting only one and a half hours and passing Nanga Parbat, may well be one of the grandest of experiences. The roses were just at their best when we put up the tents in front of the rest-house. After we had got through the inevitable introductions with the local dignitaries and their friendly invitations, the six high porters, whom we had ordered in advance, arrived. They all came from the Hunza land, a few days' journey away, which has already been visited by many expeditions. These are the same Hunzas who speak that mysterious Burushaski, and who for a long time have been described as the most healthy people in the world. At present the Hunza people are almost exclusively proposed as high porters to climbing expeditions working in the Gilgit Agency area, although the inhabitants of the principality of Nagar should be just as suitable. Sherpas are not allowed to enter Kashmir.

Issar Khan was recommended as leader of the porters; like the other five high-level porters (Johar, Kabul, Ali Madad, Amminullah and Habibullah) he had taken part in earlier expeditions. Mir Zaman from Iskere was hired as postal runner.

¹ Hans Gyr, Karakoram Expedition 1947, *Berge der Welt* 1949, pp. 3 seq. Reinhard Sander, The Peaks Around Chogo Lungma, *The Mountain World* 1956/57, pp. 204 seq.

² See Ralph Barker: *The Last Blue Mountain*, London 1959.

With the arrival of Cpt. Jameel ur Rahman, the Pakistani liaison officer, our team was complete. Together with the scientists, we left Gilgit in eight jeeps, which carried all the expedition's baggage, drove by an adventurously constructed road through the stony and sandy waste down the Gilgit River, and then branched off across the Alam Bridge into the Indus Valley.

The actual approach march on foot started at Sassli (Sassi), a small village on the Indus at 4855 ft., which is like an oasis and owes its existence solely to careful irrigation.

Acting as an advance party, Ebner, Hammerschlag and I, accompanied by the high-level porter Johar, reached the entrance to the Haramosh Valley on April 26th, by way of the mouth of the Haramosh River, a 1000-ft. step. With primitive sign language and finally by using Arabic—the priest of the valley acted as interpreter—I managed to make myself understood in the first village. The language of the valley is Shina, of which at that time we did not understand a single word.

One hundred and twenty-five porters, who with the help of the village headman had been brought together in a hurry from the villages of Sassli, Tasso, Barche, Iskere and Gure, transported the loads up the valley.

The Haramosh Valley, together with the Khaltaro Valley, is one of the most interesting areas in the whole Gilgit Agency, not only in a mountaineering sense but also scientifically. It runs almost due north from the northernmost loop of the Indus Valley at Sassli, taking a sharp bend to the east just beyond the village of Tasso, at an altitude of c. 6200 ft. In these lonely villages, situated at a height of c. 10,000 ft., mysterious cults have survived in spite of Islam. Most of the valleys are shut off completely from each other and can be entered only by way of steep high-lying passes. It is due to this circumstance that customs and manners, the caste system and the organisation of trades have survived almost unchanged.

As we made our way up the Haramosh Valley with the scientists, we climbers, too, noticed many scientific problems which we would otherwise have passed by.

The special interest of the ethnologist was aroused by Shamanism, which flourished in the Haramosh Valley especially. During the approach march we were able to take part in the consulting of a fairy, which was carried out by a young magician.

For the geographer, too, an immense field was opened up. Prof. Wiche concentrated chiefly on morphological and cultural-geographical studies; forms of settlement and economy, irrigation and dry farming, organisation of water distribution, extremely primitive field working methods, planting sequences,

inheritance rights, mortality. These were just a few of the problems involved. The fact that mortality among children, due to the primitive and completely unhygienic living conditions, as well as general undernourishment, amounted to as much as 60%, was particularly shocking. The average expectation of life was 28 years.

When the population came to know that we were accompanied by a doctor, no day passed but we were besieged in our tents by the sick, begging for pills.

The soil from which the inhabitants of the Haramosh Valley wrested their crops is extremely poor. The three chief villages, Tasso, Iskere and Kutwal Sar, are inhabited by the same people at different times of the year, and together they form, so to speak, a single economic unit. That is to say, the Haramosh peasant leads the life of a semi-nomad within his valley. He first sows around the lowest village at 6000 ft., then goes up to the village next in altitude, and finally, in mid-summer, grazes his sheep and goats on the high pasture at nearly 11,000 ft. These are looked upon as the sacred animals of the fertility goddess Murkum. Up to an altitude of 7000 ft. it is possible to harvest twice a year, but the terraced fields are often only a few square yards in area. The water for irrigation has to be drawn from the glacier by waterchannels with many branches. The lambadar, as the head of the village and uncrowned authority in the valley is called, is responsible for a just distribution of the water. Where there is no irrigation, there are only steppe-like valley floors and desolate stony wastes.

Zoological exploration extended chiefly to small animals. Of the legendary snowman neither the zoologist nor any other member of the expedition saw a trace or heard anything.

After several weeks of extensive research work, in the course of which the scientists, too, climbed up to and crossed passes and ridges of over 13,000 ft., Professors Wiche, Jettmar and Piffel returned to Gilgit, whence they continued their journey to Tangir, Darel and Swat.

On the second evening of our approach march the climbing party reached the summer village of Iskere (c. 8200 ft.). On April 29th Ebner, Hammerschlag and I, as an advance party, with three high porters, left the huts of Iskere in order to penetrate as far as possible in the direction of the valley head.

The tongue of the Mani Glacier ($5\frac{1}{2}$ miles long and 1 mile wide), as the ice stream at the base of the north face of Haramosh is called, was crossed and the primitive moraine path improved. At the pasture grounds of Kutwal Sar, north of the Mani Glacier, the permanent snow cover eventually began. We had passed quite abruptly from the summer heat of the Indus Valley, by way of the

blossoming apricot trees of Iskere, into mid-winter. A further advance had to be broken off at an altitude of 10,650 ft.

Avalanches at the foot of the Haramosh north face

As the masses of snow prevented any further advance by the valley porters, the coolies were dismissed. We therefore established the first and preliminary Base Camp (also called Forest Camp) at 10,350 ft., on a small hill north-west of the Kutwal Sar, a little lake enclosed by beautiful frontal moraines.

Truly, one could not have imagined a more beautiful camp site. It afforded a unique view directly upon the massive Haramosh north face. Separated from us by the width of the Mani Glacier, it towered another 13,000 ft., the summit rising towards the dark sky like something out of this world. We stood spellbound before the goal of our long journey, the image of our dreams which had now become reality. But we were not to invade the realm of the demons unpunished. Unknowingly, we had chosen for our camp a spot that was regarded by the natives as holy; thereby we attracted the irreconcilable hatred of the Racis (fairies). This hostility was the reason why the high-level Hunza porters left us a few weeks later.

Shamanism in the Haramosh Valley teaches, amongst other things, that supernatural beings—they are supposed to be chiefly fairies—live on the peaks of the mountains. Haramosh, much dreaded by the natives, is accorded particular respect as the fairy castle, so to speak. Any attempt to ascend this mountain was looked upon as desecration; the Dajal (magician) of the valley had predicted failure for the expedition, and even death for several sahibs and porters.

Only a few days after our arrival we were aroused from our sleep by a fearful roar. A dust avalanche had shot swiftly down the entire north face of Haramosh, crossed the wide Mani Glacier and climbed up the steep moraine; it bent the birch-trees like reeds, tore open the tents and swept away equipment and food. We shook the snow from our necks and our sleeping bags. But this was only the prelude. For the month and a half during which we worked in the shadow of the north face there were days when avalanches came down hourly, though at this valley head it was virtually impossible to find a spot completely safe from them. The whole Mani Glacier, like the large hanging glacier on the north face itself, is fed entirely by avalanches and is typical of those avalanche glaciers without névé fields.

Our team's first task consisted in advancing the provisional Base Camp as far as the valley head (11,300 ft.) with the help of the high porters, and further to

reconnoître an ascent over the steep 4600-ft. face leading up to the Haramosh La (15,912 ft.) which closes the Haramosh Valley on the east.

By daily marches, much hindered by heavy snowfalls and continuous avalanches, sahibs and high porters carried the loads to the Base Camp proper (11,300 ft.).

On May 10th Ebner and I occupied the first tent of this camp. We had taken upon ourselves the task of searching for an ascent route, as safe as possible, to the Haramosh La. As we learned that the English route, described by the porter Johar, was much exposed to avalanches, we chose to try the buttress to the north of it. In chest-high fresh snow we reached a saddle at 13,780 ft. on May 12th and 13th. Bad weather, together with continuous snowfalls, made further reconnaissance impossible for the next few days.

On May 17th the team divided: Hammerschlag and Ebner continued the ascent of the buttress and reached the top of the ridge the same day. The height they had reached was reckoned as about 16,750 ft. But the ascent by this route was too steep for porters and out of question.

Roiss and I, accompanied by Johar, therefore chose the middle route, between the buttress and the English route. Generally we kept to the left of the large couloir, which runs straight down from the Haramosh La to the Mani Glacier. Through deep snow at first, and after crossing several small avalanche lanes and rock spurs, we reached the saddle of the Haramosh La by way of a final steep pitch. The unfavourable snow conditions and Johar's awkwardness explain why it took us six hours to make this ascent.

The best way to the first high camp had thus been found. Our joy was great. The further ascent, even if very difficult, seemed to be laid out for us. It was a bold and beautiful route that lay before us: over four miles long, at an altitude of 19,500 ft. throughout, a ridge ran from east to west to the summit structure proper. But the approach to this path between heaven and earth was guarded by four outlying summits, each over 20,000 ft. high, which had to be crossed; we called them Mani I, II, III and IV after the Mani Glacier which has its source at their feet.¹

As the difference in altitude between Base Camp and Camp I, some 4600 ft., proved too much for the porters, a Depot Camp was established at 13,800 ft., on the lowest rock spur coming down from the Haramosh La, and this was occupied by Ebner and Pauer with three porters on May 25th. Transporting the loads

¹ This nomenclature is not official. We made use of it among ourselves in default of other names.

between Base Camp and the depot on the one hand, and between the depot and Haramosh La on the other, proceeded very slowly because of the bad snow and weather conditions.¹ This had the one advantage that we could get acclimatised gradually. But the demons of the mountains were not content with damaging the tents at Base Camp with their continuous avalanches, but towards the end of May they seemed to have prepared a larger coup.

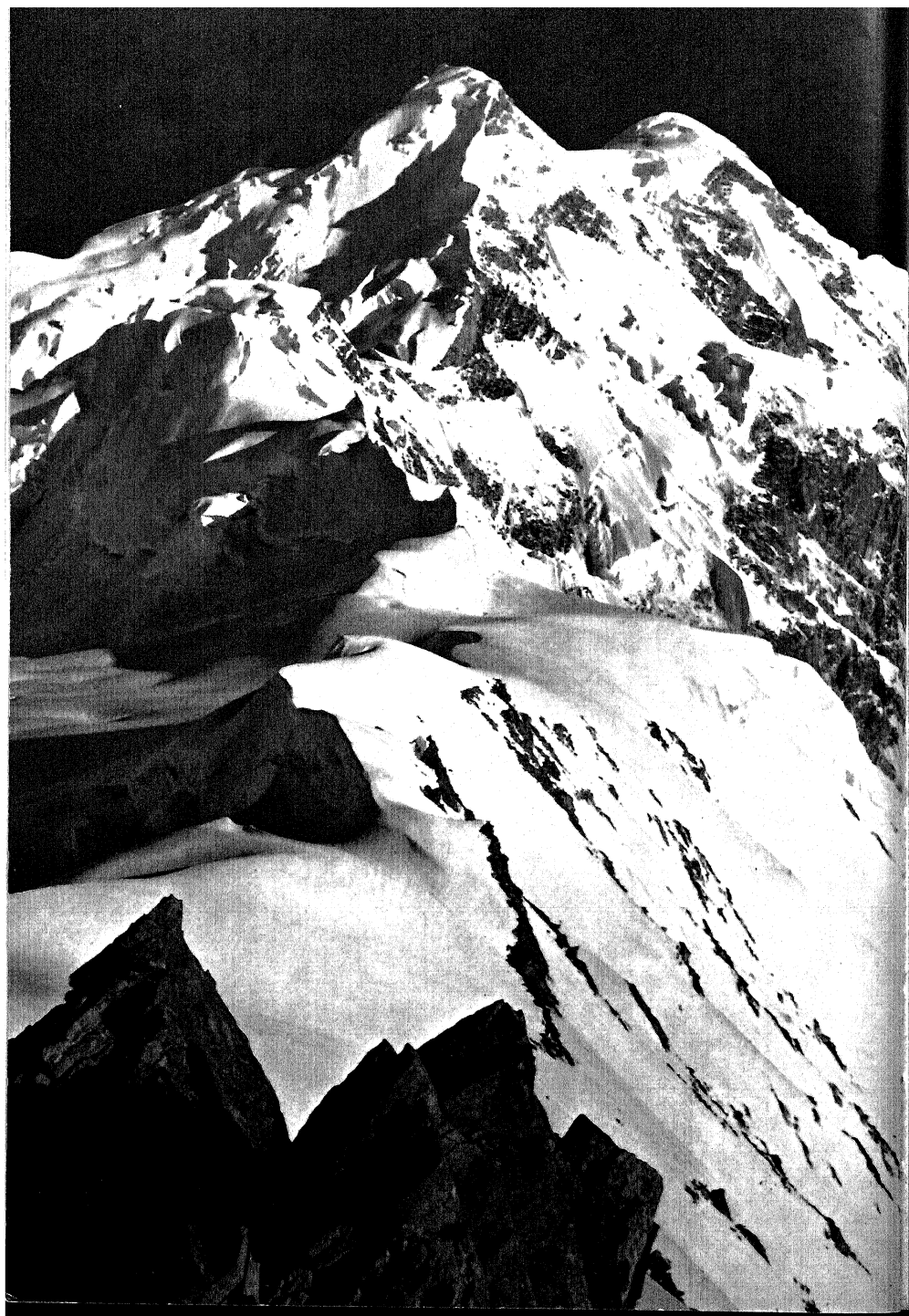
During one of those difficult passages through a gully, just below the depot, the doctor fell and finished up in a crevasse with two broken ribs. A few days later the porter column, strengthened on this day by people from Iskere, was caught by an avalanche and eleven valuable loads were buried under masses of snow. Sahibs and porters were able to save themselves, some of them being only grazed by the avalanche, but while probing and searching for the loads, Roiss's shoulder, not yet completely healed from an accident at home, failed once more. Thus we lost the services of two comrades. Their temporary loss hit us hard. The high-level porters, who had been deeply impressed by the magician's predictions, grew more unwilling to work and more afraid every day. Hardly a day passed without at least one of them trying to shirk the carrying of loads under one pretext or another. Each time it took all our powers of persuasion to get them to work. Mostly the Sahibs carried loads that were just as heavy as those of the porters; we even took their loads at the steeper pitches and distributed them amongst ourselves, doing the strenuous track-making in addition. The mountaineering qualities of the Hunzas had been disappointing as soon as the first difficulties appeared, though they had all taken part in earlier expeditions. On May 30th the high-level porters left us for good, uttering grave threats, directed chiefly against the liaison officer, because we had not given in to their insolent wage demands. Cpt. Jameel and I assumed the task of returning to Gilgit in order to fetch new porters. In great heat, partly through waterless stony and sandy wastes, we marched back 40 miles, and ten valuable days had passed before, joyfully greeted by our comrades, we arrived back at Base Camp with six new Hunza porters (Ziaret, Farmano, Masak, Hassan and Dado). They were led by Muhammed Wali, but like their predecessors displayed no particular energy as time went on, but were at least more docile and less aggressive. Masak had to be sent home as early as the fifth day; he was completely useless and had no climbing experience. Dado alone achieved surprisingly good performances at times.

¹ In general the Haramosh region seemed to be a zone with especially heavy precipitation. The Haramosh and Mani Peaks proved special points of attraction for bad weather.



18 HARAMOSH (24,262 ft.) with 13,000 ft. high north face, North West Karakoram. First ascent by an Austrian expedition 1958.

19 overleaf: VIEW FROM HARAMOSH LA (15,900 ft.) towards Mani Peak I (approximately 20,000 ft.) and II (20,500 ft.), North West Karakoram. (Photographs by Austrian Himalayan Association)



Haramosh La ; Camp I

By mid-June we had so much equipment and food on the Haramosh La that Roiss and I could move on to Camp I. We left Base Camp at three in the morning on June 15th, reached the depot (13,780 ft.) just as our comrades were preparing breakfast in the tent, and climbed on with them to Camp I (15,912 ft.). After a short farewell our comrades returned to the depot on the spur, and we were alone for the first time in the great solitude. It was a grand feeling. It was only now that we became fully aware of the fact that we were in the midst of the infinite spaces of Asia. The view stretched far away to the east, and the mountain group beyond the Chogo Lungma Glacier thrilled us again and again by the manifold shapes of its peaks. The north face of Haramosh and the wild séracs at the foot of its outliers filled us with respect. Truly, we had chosen a beautiful goal.

The wind, which swept the whole day across the La, foreboded a disturbed night in the tent. In spite of the long and steep ascent which lay behind us, we set about excavating a snow cave in the Haramosh Glacier the same day. It required a great effort to cut out the cubes of snow and ice in a crouching position and transport them through the small entrance into the open. But we were not to regret it. In Camp II we lived likewise in a cave, at an altitude of 18,000 ft., and despite strong winds enjoyed excellent sleep. Thus, the construction of snow caves, which we had practised in several training camps at home, had fully proved itself. In the late afternoon the cave was large enough for laying out two air mattresses side by side, and weariness granted us a deep sleep, except that the bivouac sack, which protected the cave's entrance, clattered in the wind.

The liaison officer and the doctor were the last to leave Base Camp on June 25th and move up to join us on the La. Pauer and Ebner, who had untiringly directed the clearing of the Depot Camp, had followed with the porters at the end of the month. We others, in the meantime, had completely consolidated Camp I, which was to replace Base Camp in case of retreat. The weather, too, improved; the nights were bitterly cold, so that it became an effort to get out of the warm sleeping bags at three in the morning. Around noon, however, a brooding heat lay in the glacier basins, so that any initiative seemed to be stifled. We suffered a great deal from these great differences in temperature between day and night.

On June 23rd we advanced for the first time as far as the upper plateau of the Haramosh Glacier, we chose at first a route through the icefall which led up to the base of the outliers. On this route we found, projecting from the ice, an aluminium ladder which had apparently been left by the British expedition of the

previous year. The height we reached on this day we calculated as 17,060 ft. The following morning Roiss, Jameel and I set out from Camp I once more, by-passed the crevasses on the east, and, by a curve to the west, reached a ramp leading straight up to the steep north-east flank of the Mani Peaks. To the south-east we could now see the saddle (17,700 ft.) which Gyr had reached in 1947. The sun stood high in the sky and had softened the snow to such an extent that we broke in up to our knees. Across the first steep step we dug our way up through the snow until, after a very steep pitch, we stood below an ice fall. A small plateau at 18,250 ft., fairly well protected from avalanches and ice falls, seemed a suitable site for Camp II. The rucksacks were deposited on this spot. We continued the ascent over the uniformly steep flank and after another hour could step on to the first saddle in the north-east ridge. The altimeter showed 18,830 ft. It was a solemn moment. For the first time we could look, as it were, sideways into the group of outlying summits. The way to the last build-up before Mani I and II certainly seemed possible over the ridge which rose at a steep angle from this point. But at first we were repeatedly distracted by the view which this saddle afforded to the south and particularly into the Baltoro on the east. Mustagh Tower, Masherbrum, K2, Hidden Peak and whatever their names might be, stood clearly before us. In admiration we looked around the circle of the numberless peaks.

Camp II

On July 8th all sahibs had gathered at Camp II (18,250 ft.), which consisted of well-constructed snow caves. Our mood could not be described as the best. The weather had deteriorated considerably, snow set in regularly at midday, and thick fog settled on the steep flanks, restricting visibility in all directions. Roiss had slid some 80 yards on a snow slab which had broken off below Camp II, and had somersaulted several times. Fortunately he only suffered from shock; but the porters, who had witnessed this incident, lost any kind of drive thereafter. The laboriously made track of the previous day was wiped out by strong snow gales that lasted for hours, and had to be made afresh. Two comrades and three porters complained of severe headaches. They descended to Camp I in order to recover from slight altitude sickness. Pauer and Hammerschlag had tracked ahead over the north-east ridge and reached an altitude of c. 19,400 ft. in a hollow just before the final build-up of Mani I and II. They reported nothing pleasing about the route beyond: a very steep and difficult ice face, 650 ft. high, leading up to the summit of Mani II, barred the way. We therefore first chose the easier ascent of

Mani I. Even then it was not yet certain over which of these two the ascent would take us, but it seemed impossible to by-pass them. Over the north and the steep north-west flank, the latter completely covered with bone-hard ice, Hammerschlag, Roiss and I succeeded in ascending to the summit of Mani I (c. 20,000 ft.) on July 9th. Our delight at the first ascent of this six-thousander was short-lived, for we had to concede that a further advance with loads at this point would be wasting too much time and would be dangerous also. So there was no alternative but to turn to the forbidding ice flank of Mani II. We examined it for a long time; at the very top the huge summit cornice shone like a crown, and yet there was only one way, and that straight up.

Mani II; Camp III

At the foot of the flank a high-level tent was pitched (19,400 ft.). The sick comrades had already recovered and work could start. What we had been afraid of happened: the porters, intimidated by the steep and difficult terrain, declared they would carry the loads only as far as this tent. Not for anything in the world would they go any further. It thus became clear that throughout the further ascent we would have to transport all baggage ourselves. The face had to be prepared in such a way that we could pull the loads straight up to the summit. The snow at first was chest-high. For three days we worked in turns on this steep face, where eventually the hard ice came to the surface. Sitting in a bergschrund, which ran straight across the face, the rest of us secured the one who, high up on the double rope, cut steps into the ice, drove in the pitons and fixed the ropes. We gasped in the great mid-day heat, which was very trying at an altitude of about 20,000 ft. At last, on the fourth day, we cut off the cornice with a few forceful strokes. The difficult Mani II (c. 20,300 ft.) had been climbed for the first time.

We breathed again, not so much in delight at having conquered the wall and, as we were to realize later, the most difficult section of the whole ascent, but because the route to the next outlier lay open before us. A level hollow, at the corners of which stood the four Mani peaks, lay at an altitude of 19,820 ft. and offered a favourable site for Camp III, which we now wanted to pitch.

But first the loads and the rucksacks had to be pulled up the steep flank one by one, a task that lasted for hours. Roiss and I occupied the first tent in order to reconnoitre the further ascent. Our comrades descended, intending to join us again with further supplies.

Mani IV; monsoon at 20,000 ft.

We sat in solitude before the tent and watched the sinking sun. In the south-east rose the bold summit of Mani III, which may well have exceeded the other outliers by a thousand feet. Now we could look at it more closely for the first time, as it had not been visible from the Haramosh La. A steep *névé* ridge ran from the north-east to the summit, where the rocks shone with golden light in the evening sun, and fell just as sharply to the west as a rock ridge. Alone of the outliers, it remained unclimbed. Our way led us past it on the north. In the west, about one hour away from our camp, stood the ice dome of Mani IV, where our thoughts had been wandering for a long time. What difficulties would we find in the long ridge that began at this point? Would there be any possibility at all of getting near the summit structure with the loads? For days we had been in the grip of a certain uneasiness which drove us on. It was question a whether all our efforts were already too late. We knew, of course, that the monsoon in the Karakoram is not as a rule so severe as in the Central Himalaya, but even the weakened forerunners of the monsoon could force us to final retreat. It was already July 13th, and beyond Mani IV the big secret of our Haramosh ascent still lay.

Making a quick decision we put on our crampons and began the ascent of Mani IV over the moderately inclined flank. At eight in the evening we stood on its highest point (20,500 ft.). A strangely sinister picture presented itself to our eyes: yellowish-black and uncanny, a long wall of clouds lay to the south and had veiled Nanga Parbat. A few more paces west and the ridge lay open before us for the first time, long, frequently corniced, and with many points where the slopes dropped steeply down on either side; several spots were quite indistinct or could not be seen from where we stood. The ridge seemed dangerous, yet it drew us as if by some magic force. Somewhere at its end we wanted to pitch our next tent. In bad weather, however, this narrow track could become distinctly dangerous. Darkness was falling. To the south and west, in the meantime, the black wall had spread still further, while below us the ice towers rose sombrely, surrounded by yawning abysses.

We did not want to believe yet that the first race against the monsoon had been lost, and we clung to the hope that this might be only a passing deterioration in the weather. But the barometer had risen sharply in a very short time and this seemed a clear indication. In a moment a fearful gale arose, and we ran down to Camp II as quickly as the darkness permitted. Then a hellish dance began, the like of which we had not experienced before. Lightning was almost continuous.

We hoped a thunderstorm at this altitude would clear the atmosphere. In wild flight the snow whirled through the hollow, and our little high-level tent, the only point of resistance, joined in the battle. Night fell; it thundered and stormed with undiminished force. The tent cloth clattered and threatened to tear. The height of the snow, which was driven unceasingly and with great speed against the cloth, rose rapidly and weighed heavily upon it. At first we tried, in spite of the raging storm, to shovel the snow away, but the mere attempt to open the tent seemed to lift it from its pegs. We lay down again and tried to shake off the load of snow by pressing against the tent walls. There was no question of sleep. The icy crystals drummed on the roof without cessation. For a moment the gale dropped, only to start again from the opposite direction with renewed force. This change of direction occurred so quickly that we hardly had the time to throw ourselves from the left to the right side of the tent. Finally, we lay down on our backs, our legs stretched out against the ridge pole to keep the tent from collapsing.

A glance at a watch: just past midnight. It was unbelievable how long a stormy night could last. It was now clear that the forerunners of the monsoon had caught up with us and we were prisoners. The thunder roared as if all the mountains were about to collapse. The flashes of lightning brought the only light into the impenetrable darkness. Indeed, it seemed as if, as the prediction had said, all the demons of the mountains had gathered for a wild dance to celebrate our downfall. Dawn broke, but the gale howled on. The evening of the second day fell and we had been shut up for 24 hours already without having been able to get into the open for a single minute. Uneasily, we awaited the second night. To be able to sleep for just an hour was our most ardent wish. But the gale drummed upon the cloth with undiminished force. This continuous drumming could have driven us mad. To diminish the area of attack, we took down the front tent pole, and thereby considerably diminished the danger that the tent would tear; but now the masses of snow grew rapidly and soon covered half the tent. By continuously pressing against it, we tried to push off the load. Slowly the cold crept into the sleeping bags and our wadded suits. We endured the painful hours without a minute's sleep.

In the morning we knew we would have to break out during the first lull in the storm. But it raged on the whole day and the following night. Then everything became very clear, both the new day and our thoughts: it was now or never! But it took us hours to move the snow sideways from inside and get to the tent opening, which was completely iced up. With a petrol lighter we

thawed out the zip, a labour of patience which seemed to take ages, and a break-out was contrived. Breathing again, we crawled into the open. Of the ski sticks, which had stood in front of the tent, no trace was to be seen; the deep snow had buried them. We gathered up the camera and some dried fruit, left everything else and closed the tent. We fled, but again and again we got stuck in the chest-high snow. We dug on. Only the realisation that we were no longer confined within the narrow walls of the tent encouraged us and helped us to overcome our weariness.

Then came the counter gradient to the summit of Mani II, which took us two full hours, though we had required only 20 minutes three days earlier. We stood again on this outlier; before us a new cornice projected far over the precipice, but of the fixed ropes there was no trace.

After a very long time we found a place to fix our rope. Well secured, we worked our way sideways towards the cornice, which had to be broken down before we could climb into the ice face. It was a beautiful sight to watch as the cornice, separated from the hard *névé*, swept down with the last stroke of the ice-axe, taking an avalanche of fresh snow with it down the 650-ft. face. This we had intended. Yard by yard down the fixed rope, which we dug out of the ice mantle, we slowly made our way. No further avalanche stirred. The *bergschrund* in the middle of the face was completely choked and we sank into the bottomless snow. The gale had risen again and dense greyness enveloped the scene.

We came to the surface again and now were certain of our lucky star. The second half of the flank, too, was managed without incident. The tent at the foot of the wall had collapsed and been buried. An indistinct track led away from it, which had been made by *Hammerschlag*, who had wanted to join us. He had already started the descent, making for the safety of Camp I. We were glad. Now we could follow his track, but again and again we broke in up to our hips. The fog, in the meantime, had enveloped the whole ridge, and we groped around among the crevasses which threatened us everywhere. Wide steep slopes led down to Camp II. It was lucky for us that the sun was hidden behind heavy cloud and could not cause the loose snow to move.

Of the caves at Camp II there was no trace. Our comrades and the porters had had to evacuate this camp too. So on we went! Our ski sticks rendered us good service each time we were in danger of losing our balance. Six hours had passed since our departure from Camp III, so we rested for a while on the upper *Haramosh Glacier*. The rest was well earned, but we would have preferred to lie down for a long sleep.

After another three hours we arrived, exhausted and stumbling, at Camp I and returned to life.

Haramosh La (15,912 ft.) ; the second assault

The gales on the La lasted for almost a fortnight, keeping us in the caves and the tents for most of the time. But towards the end of July the sun suddenly broke through the clouds. Radio Pakistan, which broadcast weather reports for us every evening, predicted a fair weather period, but it was not expected to last long. We held council and decided to start a second assault on the summit. The porters promised to carry the loads as far as the ice face.

On August 1st, at four in the morning, all sahibs and porters were on their way to Camp II. The snow had settled and was frozen hard. The moon shed a ghostly light on Haramosh. We were full of enthusiasm as we marched in silence across the plain of the upper Haramosh Glacier towards the outliers. Only Ziarat, the clown among the porters, interrupted the stillness of the night with his call "*J'Alh*", thus invoking some Mohammedan saint.

How the terrain had changed during those two weeks of gales! The British ladder, which we had used as bridge across crevasse, was frozen into the ground and projected over the abyss. Many crevasses barred the way where before there had been a level plain. Soon the snow grew soft, and we dug our way up through what seemed a bottomless depth. After strenuous tracking across the first steep slope we had reached the site of Camp II, but of the camp itself there was not the slightest sign; everything lay buried beneath a thick cover of snow. The site proved to have been well selected; none of the many avalanches which had come down had buried it. After probing and shovelling for hours, the caves were found and almost the entire contents salvaged. We pitched the high-level tents and the following morning continued the track to the base of the east face of Mani Peak II. Here, too, we first had to accomplish the laborious task of removing the snow cover, which was 6 ft. thick, in order] to free the tent.

To this point (c. 19,400 ft.) we had been accompanied by the high-level porters; now they descended and we four sahibs set about the most difficult part by ourselves, pulling the loads up over the 650-ft. face. But first the fixed ropes had to be uncovered once more. Section by section the fresh snow was cleared from the steep flank and the ropes carefully cut out of the hard ice.

Whilst three of us hauled up the fully loaded rucksacks, Roiss began to search in the hollow for Camp III. In spite of the tiredness which we now began to

feel—we were again at 19,800 ft.—we shovelled the whole of the camp free the same afternoon, mended the broken tent poles and put up a second tent.

During the morning of August 3rd Ebner and Hammerschlag said they would be unable to take part in the summit walk because of altitude sickness. Our dream of all reaching the summit was at an end. So Roiss, Pauer and I had to make new arrangements. Whatever happened, we wanted to make use of the fair weather and attempt an assault. One tent only was packed and this had to suffice for the last camp.

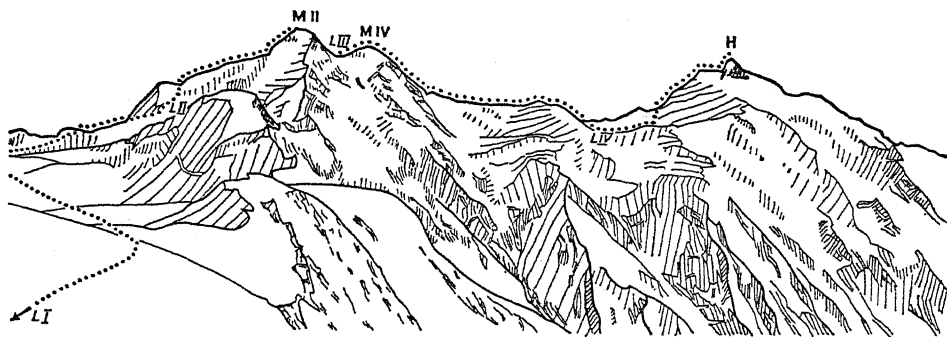
The doctor, who had recovered a little, took on the tracking as far as the summit of Mani IV, so as to save our strength for the coming exertions; then he returned to Ebner at Camp III.

The long ridge

At this point unknown territory began. How different everything looked! The sombre lighting before the monsoon gales had hidden many details. Over there, at the other end of the ridge, stood the goal of our ambitions, protected by the demons who were supposed to repel any invader into their realm.

The ridge gradually descended over a knob of rock and afforded a clear view. Left, to the south-east, stood the mountains of the Baltoro, and right, to the north and 10,000 ft. lower down, we recognised the green birch grove of Kutwal Sar. Ropework required careful attention. Roiss had disappeared into a bergschrund, ripping open the whole side of his rucksack, and we were within a hair's breadth of losing some valuable equipment and food. A further rock pinnacle had to be by-passed on the north on the steep flank. On Rakaposhi, which dominated the view to the north and whose flank gleamed in the brilliant fresh snow, a gigantic tower of thunderclouds rose up, and from Nanga Parbat to the south a long plume stretched out. Suddenly the turrets of the Baltoro, too, wore little caps, and the heat became unusually intense.

We clambered on. A ridge section, as sharp as a knife, called for extreme caution, and each man had to be secured. One of the many counter gradients took us down again to an altitude of 19,800 ft. It reminded us of the Lyskamm, except that nobody would have crossed the Lyskamm with such heavy baggage and under such conditions. The fresh snow which had fallen during the monsoon was very loose, threatening at any moment to pull us down into the abyss with the cornice. It was noon. In the north face of the mountain there was a cool shadow. On the ridge the sun burned. We were parched, but we grudged the time for brewing tea, for we wanted to get as near as possible to the summit structure proper that day. The uncertain weather did not permit a fifth camp.



Haramosh Range (after F. Mandl). L = Camps, M = Mani Peaks, H = Haramosh Peak.

On a distinct ridge elevation, the altitude of which we calculated as 20,080 ft., we rested. The ridge, which to this point had undulated roughly in an east-west direction, now bent slightly south-westwards, while at the same time the gradient steepened and the cornices hung further and further out; difficult rope-manœuvres were necessary to avoid the towers of ice.

The summit structure proper came gradually nearer, and we pitched the last high-level tent on a bold projection (Camp IV at 19,522 ft.). We brewed tea, that miraculous Asiatic drink, and for the rest of the afternoon we slept. The next day was to be the one we had long awaited. We looked out of the tent. The cloud cover had become almost continuous. The sun set, but before us, massive and forbidding, stood the steep east face of Haramosh, over which lay the way to the summit.

Fulfilment

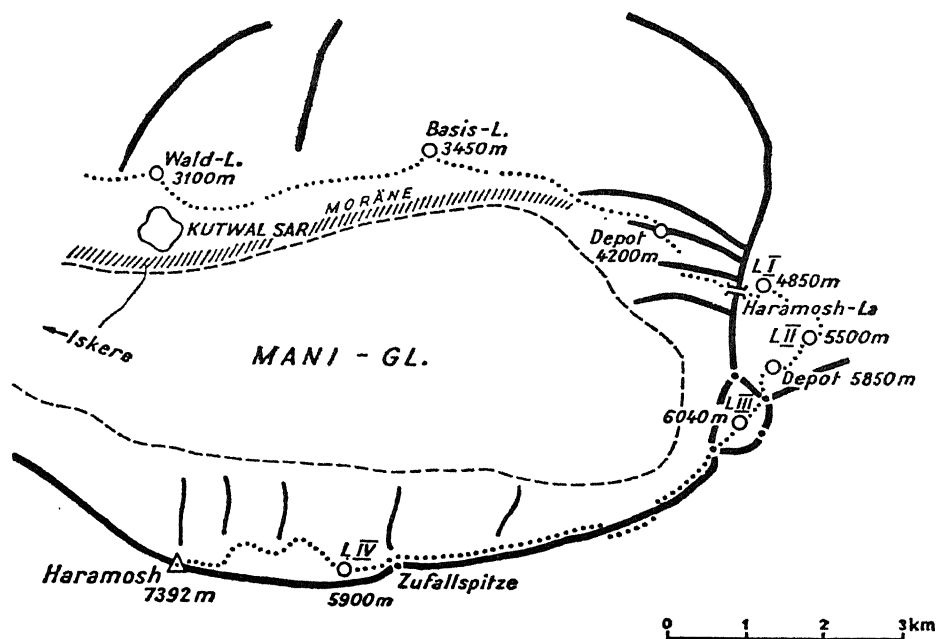
We three men lay side by side in the tent. Nobody spoke, and yet nobody closed an eye. Our thoughts had circled around the ascent for hours, contemplating the last stage of our adventure, while in the distance the thunder rumbled. At last it was midnight, August 4th had begun and we left the tent. The weather prospects scarcely seemed satisfactory, but by two in the morning we had reached the lowest point (18,850 ft.) and were thus in the hollow at the foot of the east flank. We had now to overcome some 5250 ft. of ascent.

The moon shed a cold light upon the first steep step. The snow carried well, but the weather should have been colder. The Baltoro turrets cut silhouette-like into the upper air. A vague bridge, formed by deep fresh snow, took us across

the bergschrund to the east face proper. We kept close to the ridge, as the snow there proved firmer, but the higher we climbed the softer it became. Soon we sank up to our knees into the powder. Taking turns in the lead we laboured upwards, while ice-axes and ski sticks, which we used simultaneously, gave us good service.

The altimeter showed 21,300 ft. Already the moon had given way to the rising sun, and from a small shoulder we were able to look down upon the whole length of the ridge which we had covered the previous day. The second half of the east face, which lay before us, was also attacked in proximity to the ridge; we did not trust the loose fresh snow. On the ridge we got on well, yet our speed had noticeably decreased with the increase in height. At an altitude of c. 22,000 ft. we crossed from the east face to the north side of the mountain; large cornices, which barred the way, had to be by-passed by a short descent. In this way we entered an area of dangerous crevasses. A sharp wind whistled over the edge. When we broke through the surface, our feet found little support.

Suddenly, we began to pant, our speed became erratic and the climbing more



Haramosh. Route and camps of the Austrian Expedition 1958 (after F. Mandl).

strenuous. The rising gale whipped the air from our mouths and noses. Continuous breathing through open mouths caused burning pains in our throats. The ridge shoulder (c. 23,000 ft.) came only gradually nearer, but when we reached it we took a longer rest at nine o'clock and had time to study the last imposing build-up of the summit. A steep ridge swung up to an ice bulge with an overhang of at least 60 ft., beyond which the way to the summit ridge was open. At least so we hoped. We watched the weather with anxiety, because to the south a continuous cloud cover had formed and was drawing nearer. We put our crampons on again, for we had taken them off for a short while, and climbed with utter caution up the ridge, which was exposed on either side. Having ascended, often simultaneously, as far as the shoulder, the ridge had to be secured most carefully. The steepness increased the closer we got to the ice bulge, which we had often admired and studied through our glasses from Camp I. At half-past eleven we stood just below it. A short but sharp ice ridge demanded the greatest caution. We climbed just along the edge of the bulge for several rope lengths.

It was already past noon and we seemed to be overcome with weariness. Again and again we lay down, taking glucose and handfuls of snow, and gasping for air. Tatters of fog and cloud whirled over the bulge and limited visibility. We pulled ourselves together and climbed on, stooping low, and an extreme effort of will was necessary to take just one photo. Suddenly we were seized by an inner uneasiness. Before us lay only the moderately inclined ridge, short but sharp, which led up to the highest point. The flanks fell in a sinister fashion on either side. Narrowly avoiding a dangerous cornice first on the north and then on the south side, we clambered on and at two o'clock in the afternoon, after an ascent of thirteen hours, we stood on the summit of Haramosh (24,270 ft.).

The gale set in with renewed force. The tension which had kept our senses alert for the last few days suddenly fell away and our weariness seemed to vanish. For a short time we could allow ourselves to take in the downward view, which was such as one may rarely enjoy. To the north, and 13,000 ft. below, the Mani Glacier ran towards Iskere, and the entire north face lay at our feet. A small moraine lake glittered far below, and among the green birch woods of Kutwal Sar we thought we could see the glacier stream. To the north and north-east Malubiting and Laila rose majestically, and far away on the horizon Rakaposhi, surmounting our summit by 1300 ft. How tiny looked the site of Camp I on the Haramosh La! Cloud towers were rising repeatedly to the south and east; they only allowed us to guess at the sea of peaks and blotted out the view into the Indus Valley.

When we raised the flags of our host country and our homeland into the wind for a few moments, this was not intended as a cultic act. It simply belonged to the solemnity of the hour. Neither did we take possession of the mountain, we were simply thankful that fate had allowed us to set foot on it. I deposited a small cross in the névé, voiced a silent prayer and gave a thought of remembrance to the two English climbers who had striven for the same goal and whom the mountain had claimed as victims.

THE ASCENT OF HIDDEN PEAK
(GASHERBRUM I)
AMERICAN KARAKORAM EXPEDITION 1958

By Robert L. Swift

How difficult it is to envision future situations with any degree of accuracy! As often as I have attempted to visualize from descriptions a place or experience I have been outwitted by the event itself. Thus on June 1st, 1958, when the advance-guard of our expedition sprawled on the turf at Rdokas, it was no surprise to view discrepancies in the actuality of this oft-predicted campsite. Banks of grass, terraced by rocky abutments, tumbled down to the edge of the Baltoro Glacier. An icy freshet hurtled past our camp, providing icy water of immediately potable quality. The peaks which had served as models for Sella's classic photographs were unspeakably magnificent.

Andy Kauffman, Doc Nevison, Tom McCormack and I whiled away the afternoon in pleasant conversation. That day our thoughts centred mainly on Peru, with its rugged mountains, friendly people and plentiful food. Some day, we agreed, we would acquire a sailboat and share a vacation cruise to South America. Pipedreams, to be sure, but wasn't the very fact of our being here at Rdokas as improbable as anything about which we might wish to conjecture?

Two years ago at our home in Berkeley, California, my old climbing friend Dick Irvin and I had been washing a small mountain of dirty dishes left behind by a group of free-loading acquaintances. The friends themselves were in the next room, talking and laughing. Though spirits were generally high that evening, it seemed that no one could provoke such gales of laughter as our friend Nick Clinch. Nick must certainly have a good story this time! At long last he came out to the kitchen, and we learned the basis for the evening's hilarity: "How would you fellows like to go with me to climb Hidden Peak?" he asked.

At that time Dick and I were frantically seeking funds for an expedition to Rakaposhi, and our answer was a reflection of what then (as now) seemed the greatest obstacle in the path of any American group attempting a Himalayan summit. "We'll go *anywhere*, Nick, as long as you'll pay for it!"

But Nick's suggestion had been no joke. Rather more than two years later I found myself aboard an airliner bound for New York. In the interim Nick had

recruited a climbing team, obtained permission from the government of Pakistan to attempt Gasherbrum I, supervised preparation of food and equipment lists, organized transportation, and even (most difficult of all) found sufficient financial backing for a modest attempt. During the long flight east I had time to muse on many things.

Our objective was to be Gasherbrum I, sometimes called Hidden Peak. At 26,470 ft., Gasherbrum I is the world's 12th highest peak and was then, in 1958, one of the few remaining unclimbed "Achttausender". In addition to the ever-present determination of the mountaineer to achieve his goal, our party was spurred by an additional incentive: this would perhaps be the last opportunity for an American party to make the first ascent of an 8000-m. peak. We would do our best to climb the mountain.

Gasherbrum I had been visited twice before, in 1934 by Prof. G.O. Dyhrenfurth's international party and again in 1936 by the French. On the former attempt Roch and Ertl had reached a height of nearly 21,000 ft., and in 1936 the French had been stopped by a devastating storm at 23,000 ft. At the time of our approach the mountain had been untouched for 22 years.

The realization of a dream had now begun. Though I had seen many mountains and many ranges in my climbing career, even the Karakoram itself, I was now to visit the fabled Baltoro and to see the Mustagh Tower, Askole, Rdokas and the other fascinating places whose names I knew so well.

In New York I met Pete Schoening, who was to travel with me on the same flight to Pakistan. It was indeed interesting to become acquainted with this powerful, affable man, whose experience and determination were to make him the expedition's unanimous choice for climbing leader on the mountain. In Paris Andy Kauffman and Thomas "Doc" Nevison, M.D., joined us. In Rome we met Tom McCormack, a fellow Californian who soon became a fast friend, and I was convinced that the expedition would be a social success if nothing else! Frivolous though it may sound, I believe it to be of prime importance for the members of a climbing team to be capable of getting along under duress. Early in his career a mountaineer learns that, though clear skies are desired, some storms must be expected. So he equips himself with a tent and some measure of stoicism with which to wait out inclement weather. The expeditionary mountaineer recognizes that clashes of temperament are inevitable and that he must take them in his stride. Our group was a uniquely compatible one.

Nick had preceded us to Karachi and had so lubricated the various stumbling blocks of expeditions that within a few hours of our arrival we pressed on for

Rawalpindi. McCormack was delayed slightly, waiting for the arrival of our boots by air from Egypt. As the consequence of various slight miscalculations, our reindeer-skin high-altitude boots had been shipped to that seemingly incongruous climate.

In Rawalpindi we met our two Pakistani mountaineering officers, and our complement was complete. These were Captains Mohd. Akram and Tash Rizvi, each a man of character and skill in his own field. After an enjoyable evening at Flashman's with Mr. Fosco Maraini and our colleagues of the Italian expedition to Gasherbrum IV, we emplaned for Skardu, arriving there on May 18th.

On the 21st we were on our way toward the Baltoro, accompanied by six high altitude porters and one hundred and twenty coolies. The traditional dilemma of "large expedition or small" is easily resolved in America where mountaineers must rely on the generosity of their fellow climbers for financial support on Karakoram ventures. Thus our \$ 25,000 budget, of which half was allotted to transportation, dictated that we travel with but three and one half tons of food and equipment. What equipment we did carry was excellent, the best we could select from American, Swiss and French designs. Our food, packed in England in record time, engendered some suspicions. Much to my concern I noted that most of our canned meat was either ox-tail or ox-tongue, neither a particular favourite of mine. I pondered frequently on the apparent ability of the English to raise bovine creatures with no mid-sections. But no one starved on the trip, and our return to civilization at the conclusion of the trip was the more enhanced by our somewhat austere fare.

For five days we marched our much-travelled and frequently described route, and on the sixth day we arrived in Askole. Here we selected an additional fifty coolies to carry *atta* for the rest of the load-bearers, and were off again on May 28th.

Thus far the weather had been mild with occasional showers, and now and again an annoying wind. At the Paiju camp, however, our tent roofs collected three inches of heavy, wet snow, and the coolies spent a cold night. Despite an early overcast next day, it was sufficiently hot to make the trek to Lilligo an arduous one. Lilligo to Rdokas, then, is an easy stage, and everyone reached camp early. The *sahibs*, for the most part, spent the afternoon enjoying the scenery and indulging in the aforementioned reflections and conversation. There was, unfortunately, one aspect of the place in which reality matched my presupposition with exactitude. In keeping with the local convention, the coolies spent their time initiating a six-hour "exchange of ideas". The point of primary concern was that they needed four hours next day to make up *chapatties* for the

snowy terrain ahead. My own thought was that this was rather sticky conduct on the part of men we had endeavoured to treat fairly. We had done our level best to fulfil all conditions and stipulations made by the Political Agent at Skardu concerning their treatment, and a day's delay here would place us one day short of our Base Camp when the coolies' food ran out. By dint of some mild concessions and dreadful threats we were able to attain an understanding which put our entire company on the march only a trifle late the next morning. A long march across the Baltoro Glacier took us to a medial moraine which led then to a rocky campsite. It was a splendid, clear evening. After dinner we lay snugly muffled in down and drank tea while Mozart played on the radio. As the sun died on Pajju Peak our conversation trickled out, and my thoughts turned warm, far-off and pleasant.

June 3rd was misery. Hot sun transformed the snow into a slushy mire, and every step plunged us knee deep. We camped in a poor site to the north of Mitre Peak, far short of our projected stop at Concordia. The succeeding day was cold as sin with a low overcast delivering occasional snow. But the snow underfoot was firm, and we passed Concordia at midday. Our route took us now toward the south-east, and, as this was the last day our coolies could stay with us, we pushed them on till late in the day. Intermittent snowfalls harassed us, and only with effort could we keep the coolies moving. Our plan had called for a Base Camp near the confluence of the Abruzzi and South Gasherbrum glaciers, but due to the alternate extremes of heat and cold we had fallen several miles short of this goal. Since other expeditions had commonly utilized "advanced base" camps, we felt justified in terming this site of ours "Retreat Base". Here we paid off all but twenty of our coolies, and the majority departed for their homes early the following morning. The twenty coolies we had retained, together with our six high-altitude porters and four of the *sabibs*, spent the following day shuttling loads another mile up the moraine upon which we had camped.

Schoening and Kauffman, together with the porter Rahim Khan, spent that day and the next reconnoitering a route to an actual base camp site at the shoulder of Gasherbrum VI which descends to the South Gasherbrum Glacier. Upon the return of Schoening and Kauffman it was determined that I should replace Rahim Khan in the advance party. Accordingly I was able to spend an exciting two days in exploration while the remainder of the party continued the monotonous drudgery of relaying our remaining loads to Base Camp.

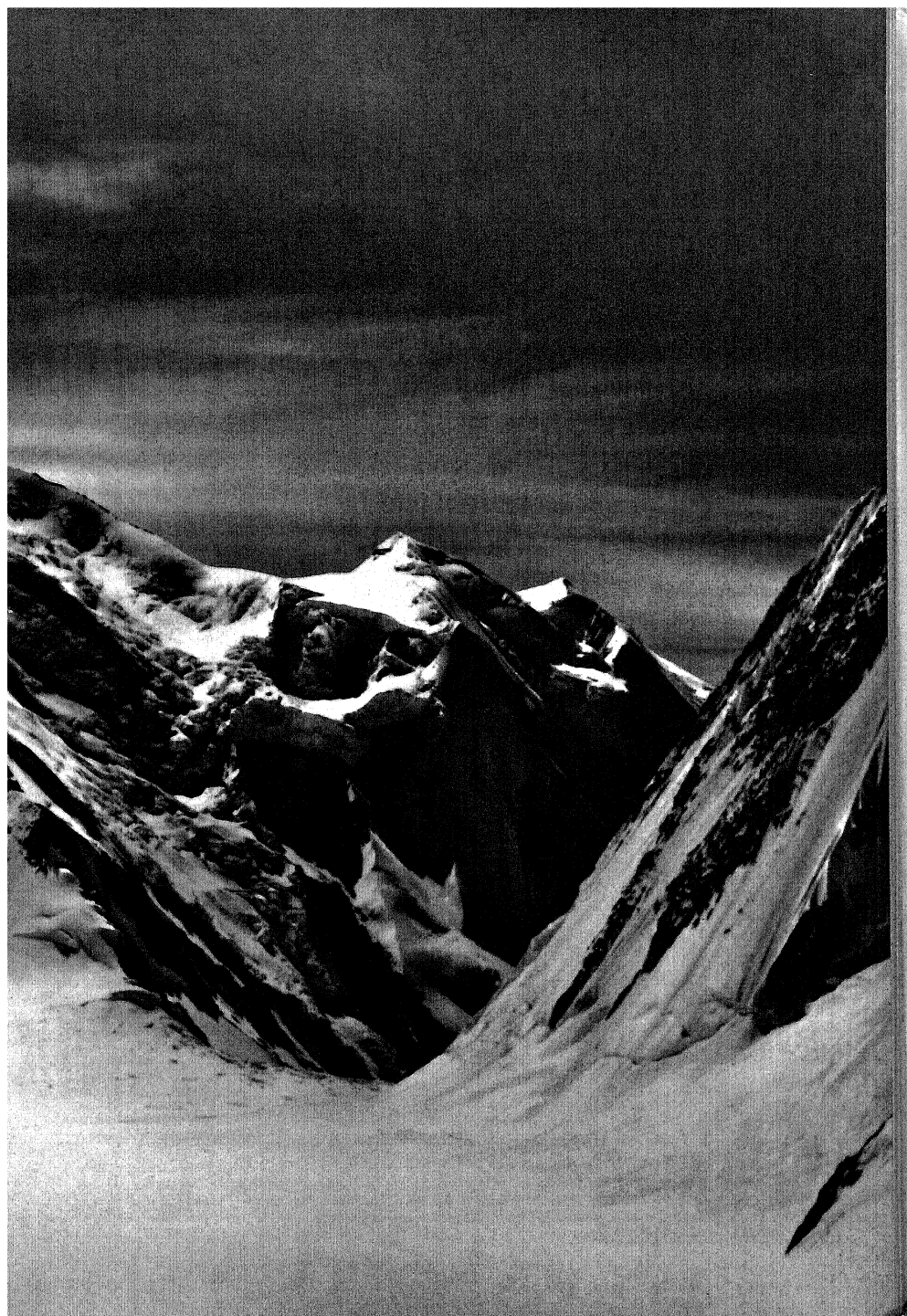
On June 6th, while I was standing at Base Camp, the overcast which had plagued us for the past three days cleared for an hour. There, at last, four miles



20 COLUMN OF PORTERS of the American Hidden Peak (Gasherbrum I) Expedition on the way to Pajju, along the Biaho River. (Photograph by American Karakoram Expedition 1958)

21/22 overleaf: HIDDEN PEAK (Gasherbrum I, 26,460 ft.) from the west, with South Gasherbrum glacier, seen from Pass P. 6748 (Baltoro Karakoram). First ascended by an American party 1958. (Photograph by Fosco Maraini)







23 top: VIEW FROM THE SUMMIT OF HIDDEN PEAK (Gasherbrum I, 26,460 ft.), looking towards Gasherbrum IV (26,170 ft.), Broad Peak (26,390 ft.) and K2 (Chogori, 28,240 ft.) on the extreme right.
bottom: THE AMERICAN PARTY on the descent from Hidden Peak, at an altitude of approx. 23,600 ft.). In the background the Baltoro Kangri range. (Photographs by National Geographic Society)

to the east and two vertical miles above my head, floated the summit of Gasherbrum I; Hidden Peak was revealed at last! Here was the mountain which we had journeyed 13,000 miles to attempt. While lambent cloud shadows played on the west wall of the mountain, I made some hasty polaroid photographs which might assist us in choosing our route. The mighty west wall itself appeared to be fraught with difficulties of an objective nature. Several hanging glaciers threatened the route from above. Descending 2500 ft. from the summit toward the north-west was a forty-degree rock slope, and beneath that a snow arete which led down to a point high on the South Gasherbrum Glacier. To the south, a slightly steeper slope dropped 2000 ft. to a long level shoulder or plateau. At the far end of this Plateau (as our optimism caused us to dub it) a forty-five degree ridge dropped to the Abruzzi Glacier.

The nearby north-west ridge was certainly a likely prospect, due to its proximity if nothing else. Accordingly, Schoening, Kauffman and I spent June 7th carrying our sleeping bags, a tent, and some food up and across the rugged ice-fall of the South Gasherbrum Glacier. Weary after a long day, we set our tent atop a 40-ft. sérac, the only level spot we could find. Next morning our enthusiasm drew us from our sleeping bags at an early hour, and we were forced to delay our start till the sun thawed our frost-numbered feet. Then began the exciting process of threading a passage through the incredibly crevassed ice-fall. Here at last was real mountaineering! The snow creaked beneath our boots as we unraveled the chaos of crevasses and weirdly illuminated séracs. Fundamentally a rock climber, I was more than pleased to be roped between the powerful and experienced pair of Schoening and Kauffman. At frequent intervals the fresh covering of snow would collapse beneath our feet as we dropped waist-deep into crevasses. At long last we attained the top of the ice-fall. Here the crevasses were no more visible, but certainly much larger. At an altitude of nearly 20,000 ft. we faced about and commenced the descent. An alternate route suggested some hope of easier going for future relays, but here a somewhat humorous event emphasized the intricately crevassed character of the route. Schoening, probing with his axe, had stepped cautiously forward onto a snowbridge. Suddenly he called, "I'm coming back".

As he floundered back off the collapsing snow, I stepped back to hold the rope taut and went waist-deep into a second crevasse. At this moment Kauffman discovered that he had been standing over a third crevasse. Not one of the three had been visible. We stopped at the tent for rest and food, then continued back to Base Camp.

Here Nevison removed the plaster cast which had been placed on my broken right hand two days before I left California; I breathed a sigh of relief.

While the three of us had been on reconnaissance, the remainder of the group had done a fine job of relaying, and we finally had a true Base Camp. On the succeeding two days we repacked, organized our stores, and became familiar with the oxygen sets. In all we had 23 two-litre cylinders of the gas and proposed to keep a couple of cylinders at each camp as protection against the potentially dire effects of pneumonia. Also, it might be desirable to use oxygen during the summit assault if our highest camp were at a considerable distance from the top.

Wishing to overlook no possible easier route, Clinch organized a second reconnaissance party to inspect the ridge ascended by Roch and Ertl. Then, while Clinch, Kauffman and Schoening spent June 11th and 12th on this mission, the rest of us ferried supplies to a point which lay on what would be the route regardless of which alternative was ultimately selected. Upon the return of this second reconnaissance team we held a council of war to decide the route of our attack. The north-west ridge appeared shorter but steeper. Its highest portion would be over rock, however, and its inception lay over the previously-described South Gasherbrum Glacier which might be difficult for coolies. The Roch Arête appeared steep but technically simple in its lower reaches, easier in the vicinity of the summit, but long and exposed across the high Plateau. We all thought of the Nanga Parbat tragedy in 1934.

Clinch favoured the southerly route, while I was the major proponent of the northerly one. The two of us entertained our compatriots with voluble expositions on the merits of our favoured choices. When everyone had had his say the party decided for the Roch Arête. The events of July 5th were to substantiate the ultimate virtues of this selection.

So now we had men, a mountain and a route. From Base Camp it was a long, but near-level six miles up the Abruzzi Glacier to Camp I at an altitude of approximately 18,000 ft. The six high-altitude porters made the round trip to this camp on June 13th, while Schoening and Nevison stayed to place fixed ropes on the route to Camp II.

The first decent camp site above Camp I was a full 3000 ft. up. Much of the route lay over steep snow, whereon we placed several hundred feet of fixed rope for safety. But the last 100 ft. lay over crumbling, 60-degree rock, and served as a fitting climax to what always proved to be a grueling day. Thus the stage was long, but necessary. On clear days one enjoyed magnificent views of Baltoro

Kangri, Sia Kangri and Chogolisa mountains as beautiful as their names. Only rarely did avalanches sweep the route, and none of our group was ever damaged by one of them.

Kauffman, Clinch and McCormack occupied the two precariously pitched tents at Camp II and commenced work on a route to the next camp. From below we had discerned an ice-dome at the top of the Roch Arête, and above this we planned to place Camp III. Camp II was cramped and never a popular camp site. Its primary virtue lay in the simple and efficacious garbage disposal system it utilized. Above Camp II there was a steep pitch followed by a spectacular, narrow, corniced ridge leading to the base of the Dome. McCormack was forced to descend as a result of what turned out to be a touch of pneumonia in the right lung. I replaced him at Camp II but was unable to assist much in pushing the route. Here the indefatigable Schoening took over and, by moving large quantities of ice and snow, made a catwalk across the difficult stretch. This pitch never failed to give me qualms. Alone or with other *sahibs* it would have been safe enough, but the porters always wanted to be roped. It is to their credit that none of the Baltis did ever tumble from this portion of the route, for we would certainly have lost them along with any *sahibs* who might have been attached.

On the 26th we made a round trip to Camp III, installing Clinch, Rizvi and two porters there to push the route on. The Dome beneath Camp III had proved to be composed of a good grade of ice and was made safe enough by the fixed ropes we had emplaced. Camp III had been pitched at about 22,500 ft. on a fine, level snow-field with sufficient room for three tents and a supply dump. From this location we would follow an undulating ridge to the Plateau, one mile to the north-west. The southern face of Gasherbrum's summit pyramid was at last in full view and looked, like virtually everything else on the mountain, possible but not easy.

On June 27th Schoening and Kauffman with the porter Hussan left for Camp III in the midst of a storm. For hours after they departed from Camp II we could hear Kauffman's shouts of "Chello! chello!" and Hussan's expostulations of woe echoing down from above. The hapless Hussan was moving poorly that day and, despite Kauffman's exhortations in French, English and Balti, the group was forced to bivouac at the base of the Dome. On other occasions Hussan and other porters had carried nobly, and we bore them no malice. Especially strong were Qasim and Rahim Khan. As an example, Rahim Khan arrived at Camp II that afternoon nearly exhausted. He had been down at Camp I feeling ill, but

despite the lack of *sahibs* there to encourage him, had left in bad weather and carried all his personal gear plus two oxygen bottles up the hill to Camp II. We fed him some hot tea and sweet biscuits, and he slept for 12 hours.

On the 28th, another day of snow, Nevison, McCormack, Rahim Khan and I carried to Camp III with McCormack leading most of the way through fresh snow. We arrived only a short time after the trio of Schoening, Kauffman and Hussan, their bivouac having detained them. All were disappointed to find that the unfavourable snow conditions had precluded progress along the ridge to the projected Camp IV.

Now at last, though, we were high enough on the mountain with sufficient manpower, equipment and food to detail plans for a summit assault. By ballot we determined that Schoening and Kauffman were the fittest and hence best suited for the first summit attempt. A second ballot placed Rizvi, Nevison and myself in a support position at the soon-to-be-established Camp IV, with Clinch and McCormack to back us up.

The following day, June 29th, Schoening led off through the loose snow over the corniced ridge toward the Plateau, followed by the rest of the *sahibs* and the three porters. The view was superb and the movement enjoyable despite the difficulty of breathing. Just short of the Plateau the ridge narrowed, and we found it necessary to trudge along over some cornices to avoid the precipitous drop to the north. The cornices proved substantial, however, and no mishaps occurred. At last the ridge became untenable. We chopped through the cornice and placed 50 ft. of fixed line which allowed us to descend a short overhang to the Plateau beneath. At this juncture Rizvi gallantly relinquished his place on the second assault party to Clinch, whom he judged to be in better physical condition than himself. He had done well in reaching this height of approximately 23,500 ft. and now returned with the porters to Camp III, where he and McCormack would assist in relaying supplies. With some trepidations at the thought of returning up over this section of the route when retreat was in order, we lowered our loads and ourselves to the Plateau and pitched two tents to serve as Camp IV.

On the morrow we had hoped that we could establish Kauffman and Schoening in an overnight camp high on the Plateau and allow them to attempt the summit next day. But we were beset now by a steady snowfall. In the morning of June 30th we carried loads out into the mist and deposited them at a dump about one and a half miles further out across the snow. Then followed two monotonous, unworkable days. Qasim and Rhim Khan had gamely stuck

it out at Camp III and on July 2nd carried loads up to the overhang, from whence they shouted to us so that we might come and pick up the supplies. Kauffman and Nevison responded. In my own opinion Nevison was the next strongest member of the team after Schoening and Kauffman. He had been selected to be a member of the expedition primarily on his merit as a physician, but had worked extremely hard as a "coolie-sahib" and was a fine companion as well. We were grateful for the additional supplies as our stocks were running low. On the fourth day of bad weather we again carried loads to the dump through heavy snow, as much for the purpose of alleviating the monotony and preserving our fitness as anything else.

At six that afternoon, July 3rd, the mists cleared, revealing in sharp-textured relief our trail across the Plateau. We had covered perhaps one-third of the distance and very little of the altitude to the saddle where we wanted to place Camp V. Luminous vapours rose across the sky with ghostly silent swiftness leaving the evening clear, cold and beautiful.

Independence Day, July 4th, and Pete was astir at 4.30 in the morning. We had thin cocoa and two cups apiece of watered ricicles for breakfast, then set off at six carrying 25 pounds each. At the dump we made our loads up to 40 pounds and commenced using oxygen for the first time. Whoever was in the lead (we alternated at 25-minute intervals) would use the oxygen at two litres per minute; but we found this barely enough of an advantage to offset the discomfort of the mask and weight of the oxygen bottles. The regulator eventually failed, and we resorted to breaking trail in 15-minute shifts. During each of these we would progress some 200 ft. and then rest for five minutes. At 2.00 p.m., at an altitude of nearly 24,000 ft., we deposited our packs. Kauffman and Schoening stamped out a platform and pitched their tent between two crevasses while Nevison, Clinch and I returned to Camp IV, arriving there eleven and one half hours after our departure.

On the morning of the 5th we observed Kauffman and Schoening moving slowly upward from their camp. Then Nevison and I returned to Camp III for a load of supplies while Clinch reorganized Camp IV. From Camp III the summit was in full view, and we were spectators to the efforts of the assault pair.

After sleeping with oxygen, Schoening and Kauffman had set off early. Numbled by the effects of altitude, they carried little food and no water, an error which caused them no small amount of agony. They found the snow to be miserably soft, and progress was slow despite the improvised snow-shoes which they wore. The day was clear but windy, and the cold was intense as their efforts

led them alternately over rock and snow. The first of their two oxygen cylinders apiece gave out and were abandoned. Without the benefit of the oxygen, which they now used at a higher rate than on the previous day, their success would have been problematical. Finally, at 2.00 p.m., they moved out of the last snow gully and plodded up to the summit.

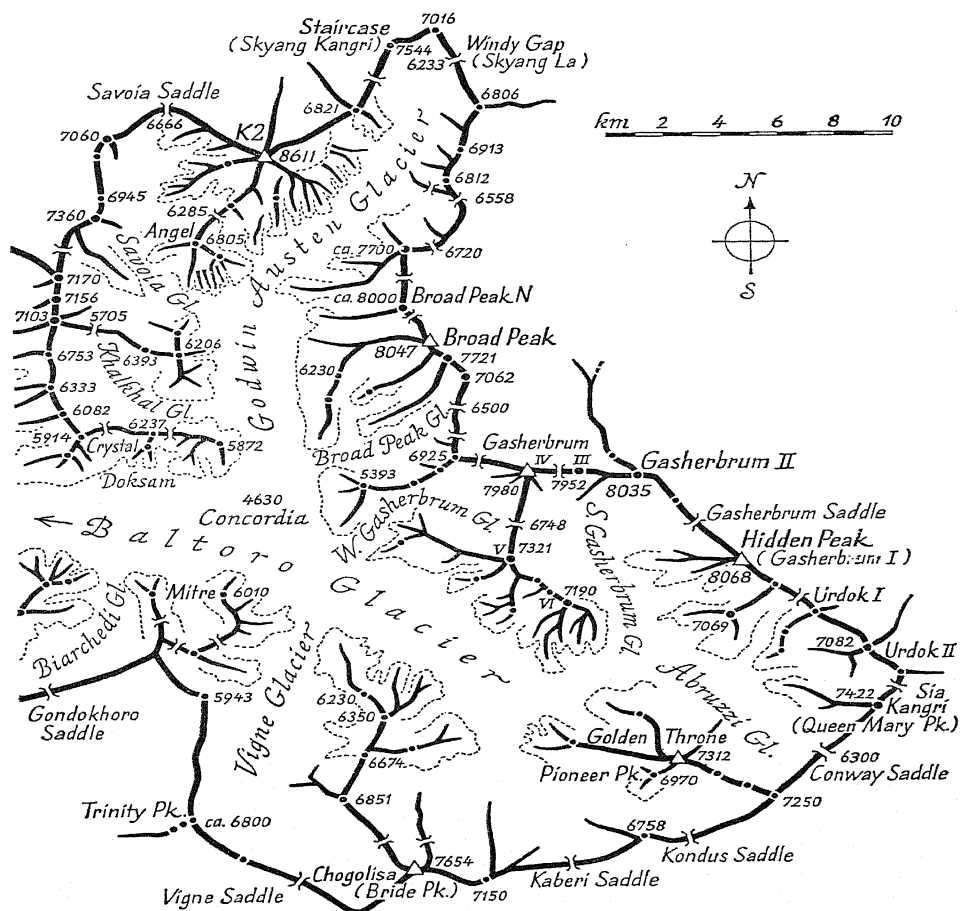
At Camp III we danced and cheered. On the top Schoening and Kauffman displayed flags of the United States, Pakistan, Free Hungary and of the many nations whose mountaineers had assisted us. A few summit photos were taken, showing marvellous views of the other Gasherbrum peaks and of K₂, but the extreme cold repeatedly froze and broke the films. After an hour's rest they started down, their energy spent, their footsteps covered by wind-blown snow, their oxygen exhausted and suffering now from cold and thirst. The return to Camp V was finally accomplished more than 15 hours after their departure that morning.

On our return trip to Camp IV Nevison and I debated the pros and cons of making a second summit try. We finally resolved that we would make the attempt if Schoening and Kauffman were able to descend without assistance and if their reports were optimistic. Clinch we knew would be game. On returning to Camp IV we realized that Clinch had been unable to discern the two figures reaching the summit, and we baited him unmercifully with feigned ignorance before sharing our ebullient joy with him.

On July 6th Clinch, Nevison and I met and congratulated the summit pair half-way between camps IV and V. We again weighed the possibilities of a second ascent, but decided we were not physically capable of repeating the feat of our terribly-fatigued team mates. We commenced to evacuate the mountain.

At Base Camp it was discovered that both Schoening and Kauffman had suffered frost bite, particularly Kauffman, whose toes turned black but recovered in time. Gil Roberts and Dick Irvin, two more Californians who had been unable to leave their jobs in time to start the ascent with us, had now arrived with cigars, letters and other welcome amenities of civilization. The Italian group on the neighbouring Gasherbrum IV had kindly traded some of their excellent rations for the food boxes we had hauled up the South Gasherbrum Glacier and abandoned. We feasted for a day on these delicacies, particularly the prosciutto which all enjoyed, and then set off for home.

Our return to Skardu occurred on July 22nd, precisely two months after our departure. We wasted little time there, but pushed on quickly for Karachi and then Europe, where we were cordially entertained by the mountaineers of Rome, Zurich, Paris and other cities, then continuing to our homes in America.



Sketch map of Baltoro Karakoram around Concordia

THE ASCENT OF GASHERBRUM IV

ITALIAN KARAKORAM EXPEDITION 1958

By Fosco Maraini

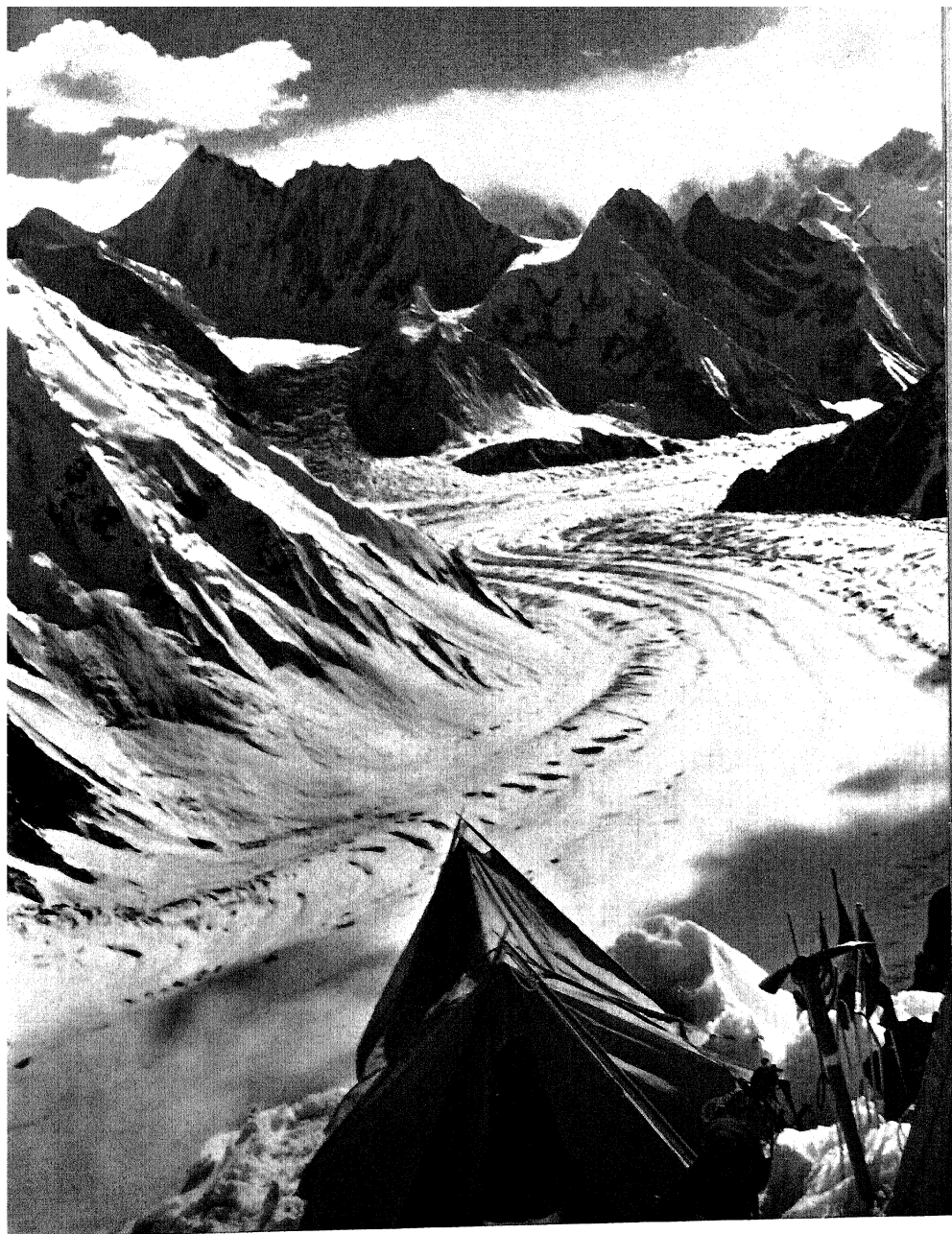
Why Gasherbrum IV?

Three things make an expedition: a team, a mountain and money. Generally the enterprise starts off with mountain and men, but no finances; sometimes you may have finances and mountain, but not the right men; ours was the third and rarest combination, we had men and money, but no mountain! At least this was the situation in the early months of 1958.

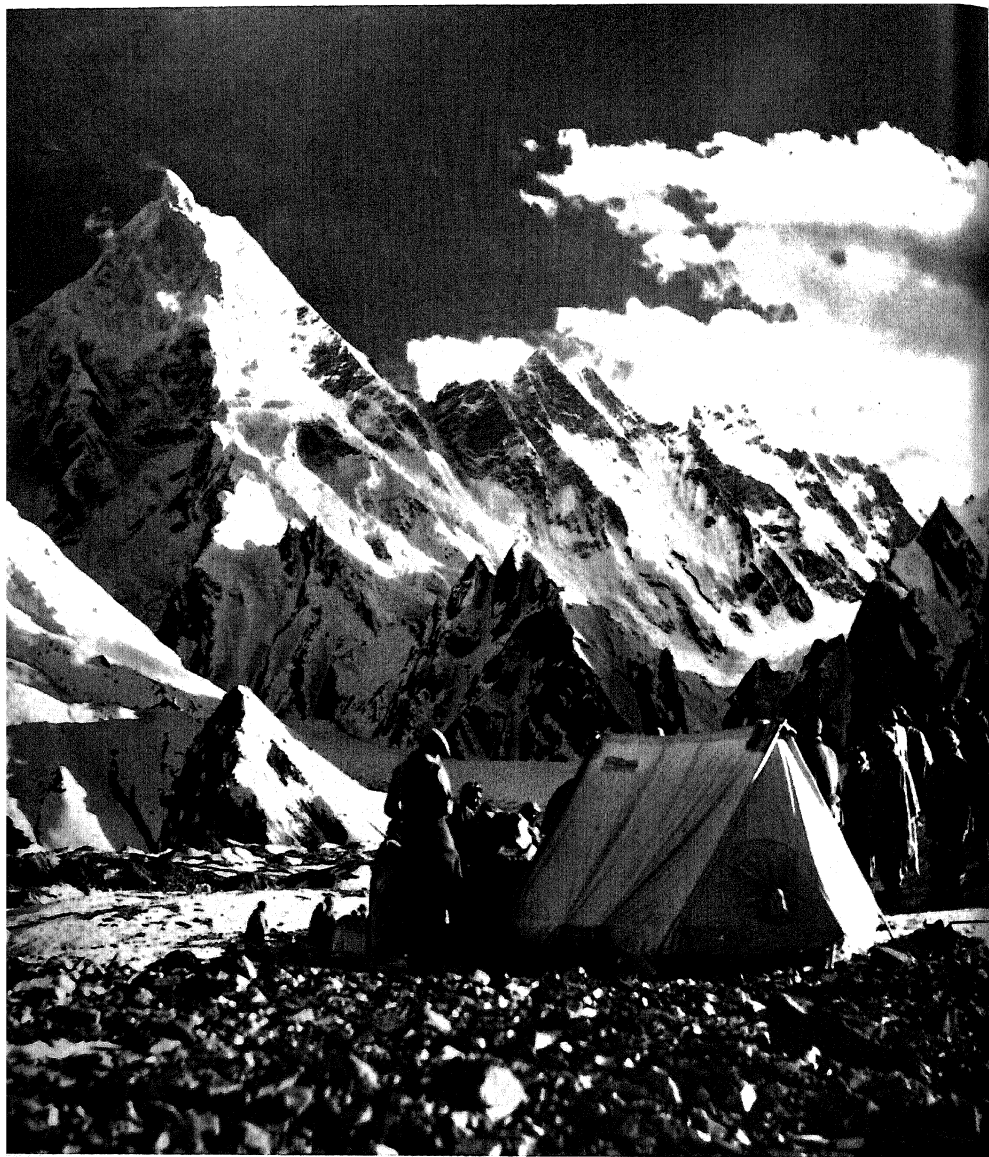
Ever since the success of K2 many of the best climbers in Italy wished to return to the Himalayas, but somehow or other various programmes put forward between 1955 and 1957 never passed beyond their initial stages. Then a man of great authority, character and foresight—Mr. Giovanni Ardeni-Morini, President General of the Italian Alpine Club—became deeply interested in the idea (“the Alps of our times, he would say, are in Asia or South America. . .”) and things started moving. By February 1958 finances and men were ready.

The new Himalayan expedition (destination as yet unknown) had been put in charge of Riccardo Cassin, 49, the doyen of Italian climbers, a man universally beloved and esteemed. Three classical routes in the Alps bear his name: one on the north face of the Grandes Jorasses (Pointe Walker), one on the north-east face of Pizzo Badile, and one on the north face of the Cima Ovest di Lavaredo in the Dolomites. Nobody could be considered better than Riccardo for a position which requires such a difficult combination of prudence and daring.

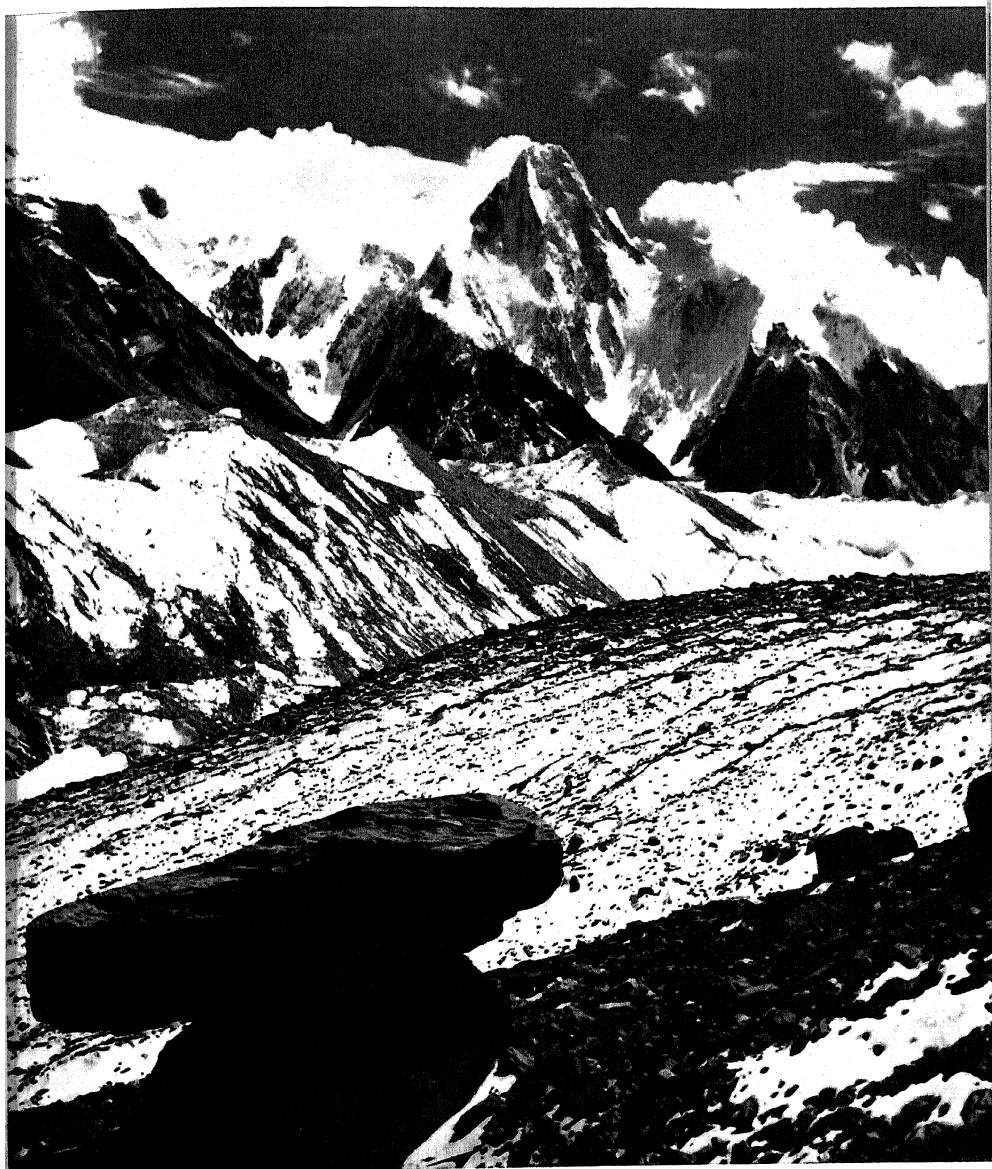
When Riccardo Cassin started recruiting a team of five climbers he had a vast choice among the best Italian names of the moment. It was only natural that Walter Bonatti should figure at the top of the list. Though barely 28 years old, his spectacular routes on the Grand Capucin, the Petit Dru, the Grand Pilier d'Angle (Mont Blanc), together with many others, have won him great acclaim. Bonatti had also been with Professor Desio's expedition to K2 in 1954, directly supporting the summit team of Compagnoni and Lacedelli. On this occasion he was compelled to bivouac at a height of about 8000 m. in the open, surviving one of the most difficult experiences a climber can be called to face. Bonatti's



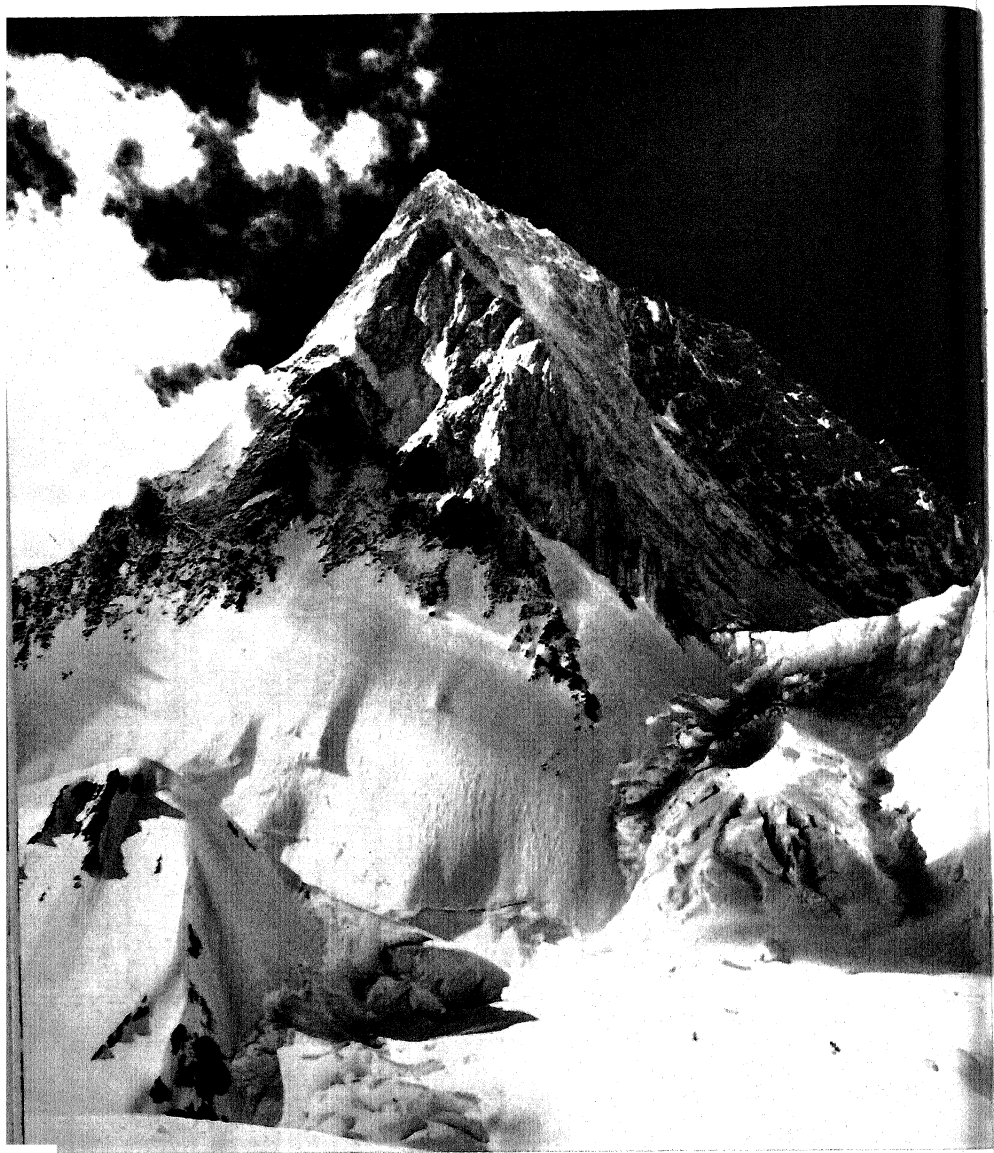
24 CAMP II OF THE AMERICAN EXPEDITION to Hidden Peak, on the spur above the Abruzzi glacier. (Photograph by National Geographic Society)



25 CAMP OF THE ITALIAN EXPEDITION to Gasherbrum IV, on the Baltoro glacier.
In the background on the left Masherbrum (25,650 ft.). (Photograph by Fosco
Maraini)



26 GASHERBRUM IV (26,170 ft.) seen from the Baltoro glacier (Photograph Fosco Maraini)



27 SUMMIT PYRAMID OF GASHERBRUM IV (26,170 ft.) from the south-east, seen from Camp II of the Italian expedition on the South Gasherbrum glacier. (Photograph by Fosco Maraini)

knowledge of conditions in the Himalayas was therefore considered to be most important.

Next to the name of Bonatti came that of Carlo Mauri, 28, from Lecco in Lombardy. The two young men had often climbed together on some of the most difficult routes of the Alps. Cassin considered that a team, used to working as a unit at home, would offer greater chances of success than one composed of men who had lacked time to get well acquainted with each other before. Toni Gobbi, the well-known guide, sports organizer and authority on the chain of Mont Blanc, was invited to act as deputy-leader. Giuseppe Oberto, 35, a guide from Macugnaga, and Bepi Defrancesch, 34, guide and instructor from Moena in the Dolomites, were then added to the list, the first for his technical knowledge of climbing on ice, the second as a formidable rock climber.

Finally, Dr. Donato Zeni, 35, of Vigo di Fassa, joined the expedition as medical officer and I was invited to take part in the team as a photographer, interpreter and—let us say—“keeper of the records”.

How was it that the expedition chose such an unpromising peak as Gasherbrum IV? This famous and beautiful mountain, which has impressed all climbers since Sir Martin Conway first described it in 1892, has two most serious disadvantages: it is fiercely difficult and stands at 7980 m., just below the 8000-m. line. But our peak was not chosen, it was offered; and in the circumstances the offer could not be rejected.

It all happened in the months of February and March 1958. A request, which had been presented by the Italian Alpine Club to the Pakistan Government in 1957, had never been granted an answer, so I flew out to Karachi on a special assignment given me by Mr. Ardeni-Morini and contacted directly various important officials in the Foreign Ministry to get a definite answer. The original request had been put in for Gasherbrum I (8068 m.), or Hidden Peak, one of the last eight-thousanders of the Karakoram Range left unclimbed; but this mountain, I soon learned, had been already allotted to an American Expedition led by Mr. Nick Clinch. Other possibilities remained, Saltoro Kangri in the Eastern Karakoram, Batura in the Hunza district, and finally Gasherbrums III and IV in the Baltoro perimeter. Eventually Gasherbrum IV was suggested as a goal for our expedition and promptly accepted. Less than two months later the expedition was on its way to Karachi.

Officials and Porters

At Rawalpindi we met our liaison officer, Capt. Abdul Karim Dar, of the Pakistan Army. We also met there some members of the American expedition on their way to Gasherbrum I. Bad weather over the Himalayas, as often happens, delayed the flights which were to take our party and our seven tons of equipment up to Skardu, so it was only on May 25th that we were finally reunited in the hospitable Rest House which has become, in recent years, a sort of Club-hut for climbers of all nations.

At Skardu we met Sir Habib-ur-Rahman Khan, Political Agent for Baltistan, whose kindness, in helping us through the many operations involved in starting off a caravan of nearly 500 men, was equalled only by his most friendly hospitality. Sir Habib-ur-Rahman gave to Riccardo Cassin (as he gave also to all other chiefs of expeditions active that summer in the same region) a letter in which the relations between climbing party and porters were officially regulated. This was a welcome gesture and I think everybody will agree that it may be easier in the future to deal with hundreds of men doing heavy work under difficult conditions if there is a law of some kind as a basis for discussions. This document will interest all climbers, be they European, American or Japanese, and I am giving it at the end of this paper as an Appendix.

The long march up the Shigar and Braldu valleys—through Askole—has been described so many times that I will skip the subject altogether. I will only mention the “Revolt of Paiju”, in which three Europeans and one Pakistani Officer (the other members of the party had gone ahead) argued for one whole day in five different languages (Urdu, Italian, English, Balti and the dialect of some remote Alpine valleys) with 490 porters; the caravan had turned into a mob, the mob into a rabble. At one instant our unruly Balti had been on the verge of deserting us. Fortunately, order was at length restored and the march was resumed, one day later than scheduled.

By June 22nd the last members of the expedition and the last baggage reached the Base Camp. This had been set up at 5150 m. on the Abruzzi Glacier, in the same spot where the Austrians of 1956 (Fritz Moravec and his companions) had pitched their tents during their successful assault on Gasherbrum II (8035 m.). All ordinary porters were now sent back and we retained only six high altitude porters (HAPs, as the Americans call them). Originally we had chosen fourteen men to work on the mountain, but long before reaching Urdukas we had to send many of them away. The Balti proved much better as ordinary porters than as HAPs. As ordinary porters they had many whims and had moments, but their

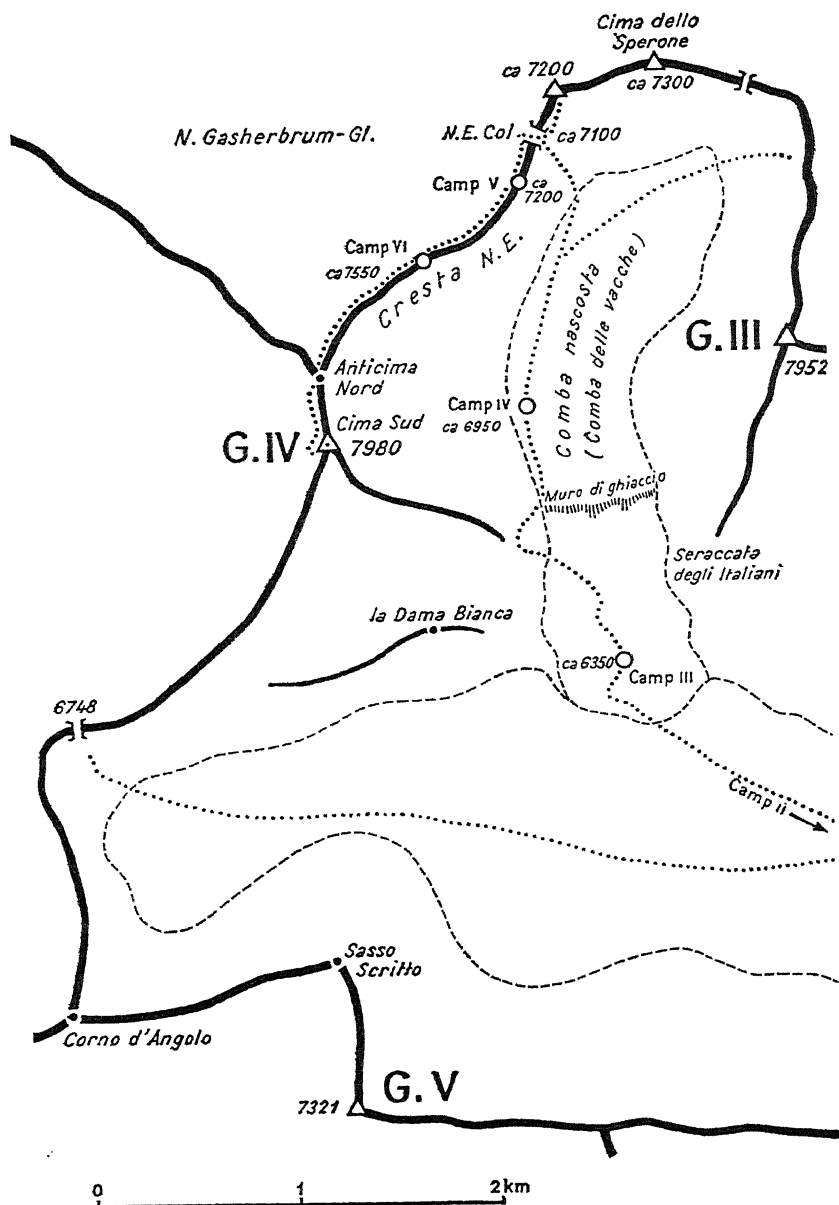
strength, their patience when confronted with very hard conditions, their resistance to fatigue and to cold, were precious in overcoming enormous difficulties during the approach march. The HAPs instead were mostly conceited, rather lazy and often in bad health. Only one man stood up to the level of a real "tiger", and that was Taqi of the village of Satpara. It was no surprise, really, because he had an excellent letter of recommendation from Eric Shipton. Mahmud Hussain, another HAP from Satpara, followed his friend with patience and good humour, but was only a poor match to Taqi.

It may be of interest to note here that in a subsequent expedition to Chitral and the Hindu-Kush, during the summer of 1959, I had a team of seven Chitrali with me. The information I had been given about these men was generally rather unfavourable, yet I found them quite good; certainly much better than the Balti, at least when acting as high altitude porters.

Exploring the South Gasherbrum Glacier

But let us return to 1958 and the Baltoro. The glacial region we had in front of us was comparatively unknown. The South Gasherbrum Glacier had been visited for the first time by the International Himalaya Expedition of 1934 when H. Ertl and A. Roch (June 26th), then Prof. G.O. Dyhrenfurth and A. Roch (July 1st), climbed the great ice-fall in their attempts to find a way up the precipices of Gasherbrum I. The same ice-fall, and a subsequent stretch of glacier, had been also explored by the Austrian Expedition of 1956, led by F. Moravec, which successfully climbed Gasherbrum II. Beyond we had to open a route on ice which had never been trodden by human feet.

The actual size of the South Gasherbrum Glacier is much greater, and its outline much more complicated, than was supposed before our expedition completed its explorations. Let me illustrate this point briefly, as it forms the most important geographical result of our journey. In all existing maps the South Gasherbrum Glacier is shown simply as a deep valley running from north-west to south-east. In reality the lower portion of the glacier runs from north to south, is very steep and covered with crevasses, but the upper part turns gradually to the west, and finally levels off into a vast plateau (the "G Cwm", the Cwm surrounded by Gasherbrum Peaks), which extends for about three miles from west to east. Finally it should be noted that this higher portion has two long narrow affluents which descend, one from north-east Col (about 7100 m.) between Gasherbrums III and IV, and the other from Gasherbrum-La (about 6700 m.), between Gasherbrums I and II. The glacier is thus entirely



West Gascherbrums Group with routes of the Italian Karakoram Expedition 1958 (after F. Maini). Altitudes in metres.

NB. - Mason's height 7980 m. for G.IV was reduced afterwards by himself to 7925 m. Desio gives even 7920 m. (Red.)

surrounded by Gasherbrum Peaks; a group of noticeable complexity and great beauty. Some photographs taken by the Japanese climbers on Chogolisa (7654 m.) give us what is perhaps the best view of the whole Gasherbrum family.

"La Seraccata degli Italiani"

During most of our march up the Braldu Valley and the Baltoro Glacier we had fine weather, which continued during and after the days when we pitched the Base Camp. We all had heard much about storms in the Karakoram mountains and we were terrified lest there might be a change; therefore no time was lost in getting acclimatized or in organizing the assault properly. We just pushed on as fast as we could in the hope of getting very high, maybe to the summit, before that horrid word "monsoon" should happen to be heard in the news bulletin. Camp I was placed just above the first ice-fall on June 22nd, Camp II in the centre of the "G Cwm" on June 25th, and Camp III half-way up the second ice-fall on June 29th.

The second ice-fall is much higher, much more difficult and dangerous than the first. It has been described by Prof. Dyhrenfurth quite rightly as "repulsive". Remembering the name "*Eperon des Genevois*" on Everest, we called it "*La Seraccata degli Italiani*" (the Italians' ice-fall). Starting from Camp III, Bonatti, Gobbi and Oberto gradually worked their way up very steep snow slopes which led to a vertical palisade, some 200 ft. high: and this closed the whole narrow valley like a wall between Gasherbrum III and IV. It was clear that huge towers and blocks of ice were detached from time to time and tumbled down the slopes, feeding the glacier below. One of these towers—the size of a large *campanile*—seemed to rest on a most unstable conglomeration of ice blocks; it was nearly completely separated from the main palisade. Passing beneath its ominous greenish mass we barely had the courage to look upwards; it was difficult to avoid the impression that a mere glance might suggest some movement to the icy monster! The creaks and groanings of the whole slope were often very unpleasant. We consider ourselves extremely lucky that no serious avalanche took place during the whole period in which we and our porters moved up and down these slopes.

The last portion of the ice-fall was the worst. After one week of exacting labour, on July 5th, a passage was opened at the extreme left (W) of the valley, on the rocks of Gasherbrum IV, and about 100 m. of ropes were fixed to assist the porters. During this period the weather was mostly good. The sun would rise in a blue sky and run its course, barely dimmed during the afternoon by

some lazy clouds. This was naturally most welcome, but the tropical brilliance made life very difficult: the skin on our hands and faces was burned down to the raw flesh, our eyes suffered from inflammation, and our throats got painfully dry. After some most unrewarding experiences climbing on open slopes in the blaze of a midday sun, we decided to get the day's work done very early in the morning, between six and ten, or late in the afternoon, between four and eight: the hottest hours would be passed resting in the tents. But even there survival was a problem. The air itself was not excessively hot, but the fierce radiation, which reached us practically undiluted by the atmosphere, seemed to pass through everything: a tent was only inhabitable when we piled most of our equipment, sleeping-bags, duvets, jerseys and trousers, on the outer surface.

During this period Carlo Mauri had to rest at the Base Camp because he had badly scalded his right arm when a pressure cooker exploded in his hands. Fortunately, his very strong constitution and his youth helped him to a quick recovery. On July 6th, Gobbi, Dr. Zeni and Mauri were again together and managed to set foot on the upper ledge of the ice palisade, above "*La Seraccata degli Italiani*".

At this point the climbers discovered an unknown hanging valley which led easily and safely to the north-east col (7100 m.) between Gasherbrums III and IV. Looking at the mountain from below it was easy to guess that a depression of some sort must lie hidden between the two giants; but nobody had foreseen it would be such a pleasant and restful valley. This was a welcome surprise after the horrid precipices of ice down below. Toni Gobbi said the place reminded him of meadows, and suggested to his ears the tinkling bells of cows; so we promptly called it "*La Combe à Vaches*"! The north-east col, at the head of this hidden Cwm, was reached on July 8th by Bonatti, Mauri, Cassin and Defrancesch. This turned out to be a real col, a possible passage between the South and North Gasherbrum glaciers, not one of those balconies, "so frequently met with in the Himalayas, which are only accessible from one side" (G.O.Dyhrenfurth). We were very pleased to establish such an important topographical detail. No passage was previously known in this section of the main watershed between the Baltoro Basin and Central Asia.

The First Assault (July 14th)

Looking at Gasherbrum IV from the north-east col it was easy to see that there must be a straight way to the summit along the north-east ridge. There were only two disturbing facts: the presence of a continuous series of obstacles

of the highest alpine standards, and a vertical drop of about 800 m., at extreme altitude. A camp consisting of one tent was placed above the col by Bonatti, Mauri, Cassin and Defrancesch on July 9th. By now the first assault was fully under way. The weather was incredibly fine: day after day the sun shone gloriously in the sky. Some times we wondered if we had not made some deplorable mistake and gone to the Andes instead of reaching the Karakoram! All this had naturally great advantages; but there were also some serious drawbacks. Apart from the sun's continuous onslaught on our persons we had never been able to rest, and our transportation from the base to the higher camps was falling to pieces. On the one hand the climbers were getting very tired; on the other hand—because of the continual rush—because the assault teams had gone too high too soon—fuel, food and equipment were reaching the upper camps late and intermittently.

From July 10th Bonatti and Mauri, aided by Cassin, Gobbi, Defrancesch and Zeni, undertook a most determined effort to overcome the tremendous difficulties of the ridge. There was a vague hope at the very beginning that the summit might be reached in one long day, perhaps with a bivouac on the descent. On July 10th Bonatti and Mauri started out from Camp V with such a plan at the back of their minds. But after the very first hour it became clear that the ridge had to be conquered slowly, leaving pitons and fixed ropes to speed up successive assaults. The word ridge was most misleading here: in reality the structure of Gasherbrum IV between the north-east col and the summit is an anthology of every imaginable alpine obstacle! There are great towers of brownish coloured rocks with chimneys, vertical faces, overhangs and traverses; there are the thinnest ridges of snow, ice or unstable slabs piled one upon the other like old bricks; there are slopes of snow excessively steep, overlooking bottomless precipices. I think it is no exaggeration to say that never before had such sustained difficulties been met with—and overcome—at so great a height.

Comparisons were often made: some snow portions of the ridge were found to be as tricky as the south-east ridge of Mont Maudit, some rocky ones as hard as the south ridge of the Aiguille Noire de Peuterey. Some chimneys were comparable with those of the Ryan-Lochmatter route on the Aiguille du Plan. A traverse on excessively steep snow, beyond the great gendarmes, was thought to resemble the first part of the Gervasutti route on the Petit Capucin. As for some slabs covered with verglas they were quite as hard as the famous final tract of the Via Major on Mont Blanc.

On July 10th Bonatti and Mauri managed to gain only about 100 m. along

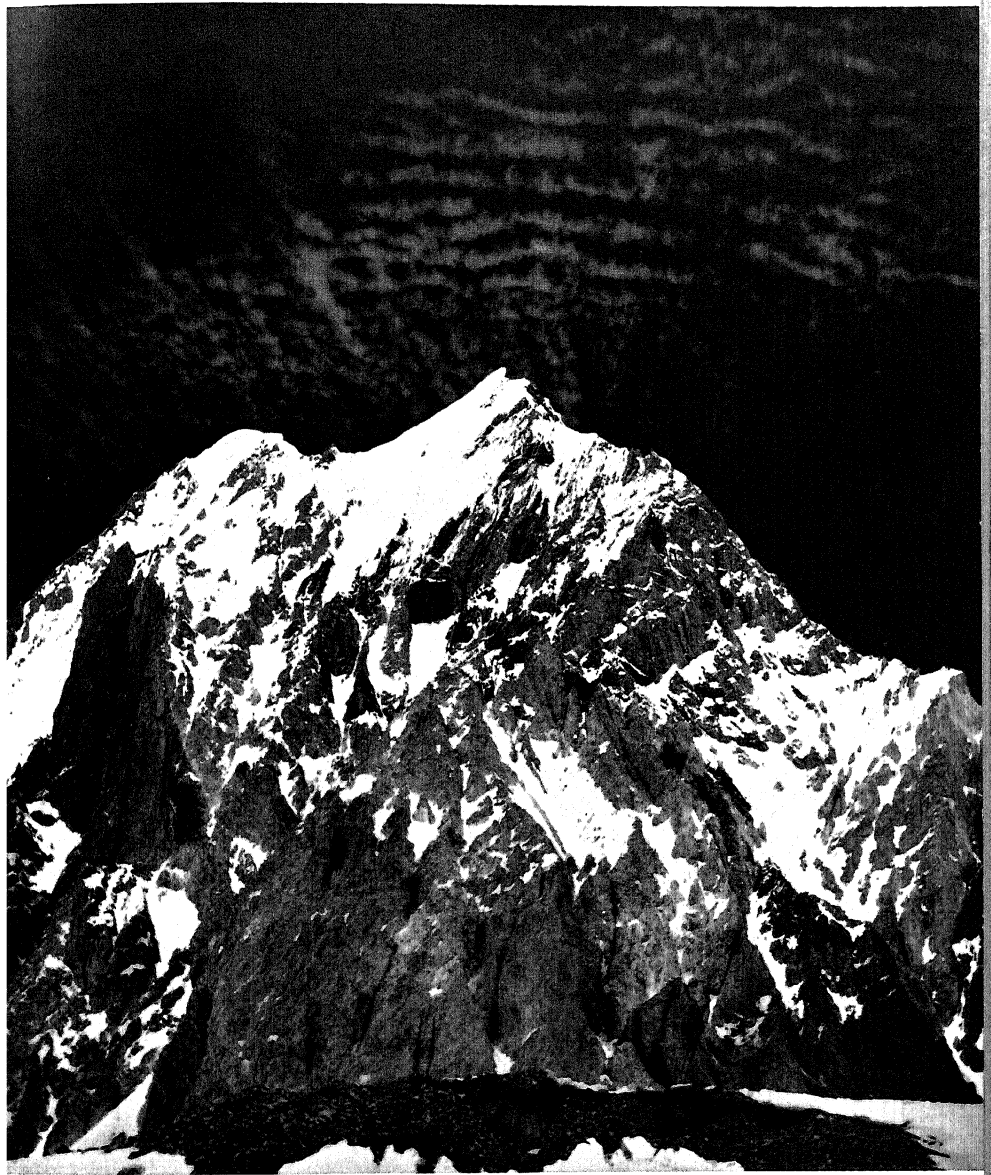
the *Cresta delle Cornici* ("Ridge of the Cornices"), then returned exhausted to Camp V. The next morning they tackled for the first time the great towers which rise defiantly astride the north-east ridge of Gasherbrum IV. After a whole day of painful progress they barely managed to find a way up and around the first gendarme ("*La Prima Torre*"). A chimney on the north side of this gendarme resembled very much the famous *Camino Bill* (Bill's Chimney) on K 2, and Bonatti named it jokingly "*Camino Bill del G IV*". It is useful, by way of comparison, to remember that *Bill's Chimney* offered one of the most serious obstacles on K 2, while its counterpart on Gasherbrum IV was just an ordinary passage, much easier, according to Bonatti and his companion, than the really tough bits encountered higher up. On the 12th Bonatti and Mauri felt very tired, and it was no wonder, for they had two days of incessant toil behind them. But with great effort they managed to move again, exploring another precious section on the long way towards the summit. That day the *Torre Grigia* ("the Grey Tower") was reached and climbed. Pitons, fixed ropes, steps in ice and snow marked the way and would all be useful to speed up subsequent assaults.

After a day's rest, on July 14th, Bonatti and Mauri started very early, roping this time to reach the summit. The two men slowly climbed beyond the first, second (Grey), the third and fourth (*Ultima*, "Last") towers, up to the *Cono di Neve* ("Snowy Cone") opening nearly 300 m. of new ground. Yet the summit appeared immensely distant, with many intervening and unexpected obstacles. It became quite clear by now that a Sixth Camp, placed somewhere high on the ridge, was necessary to reach the summit with safety. The distance from Camp V was too great.

Return to Base Camp

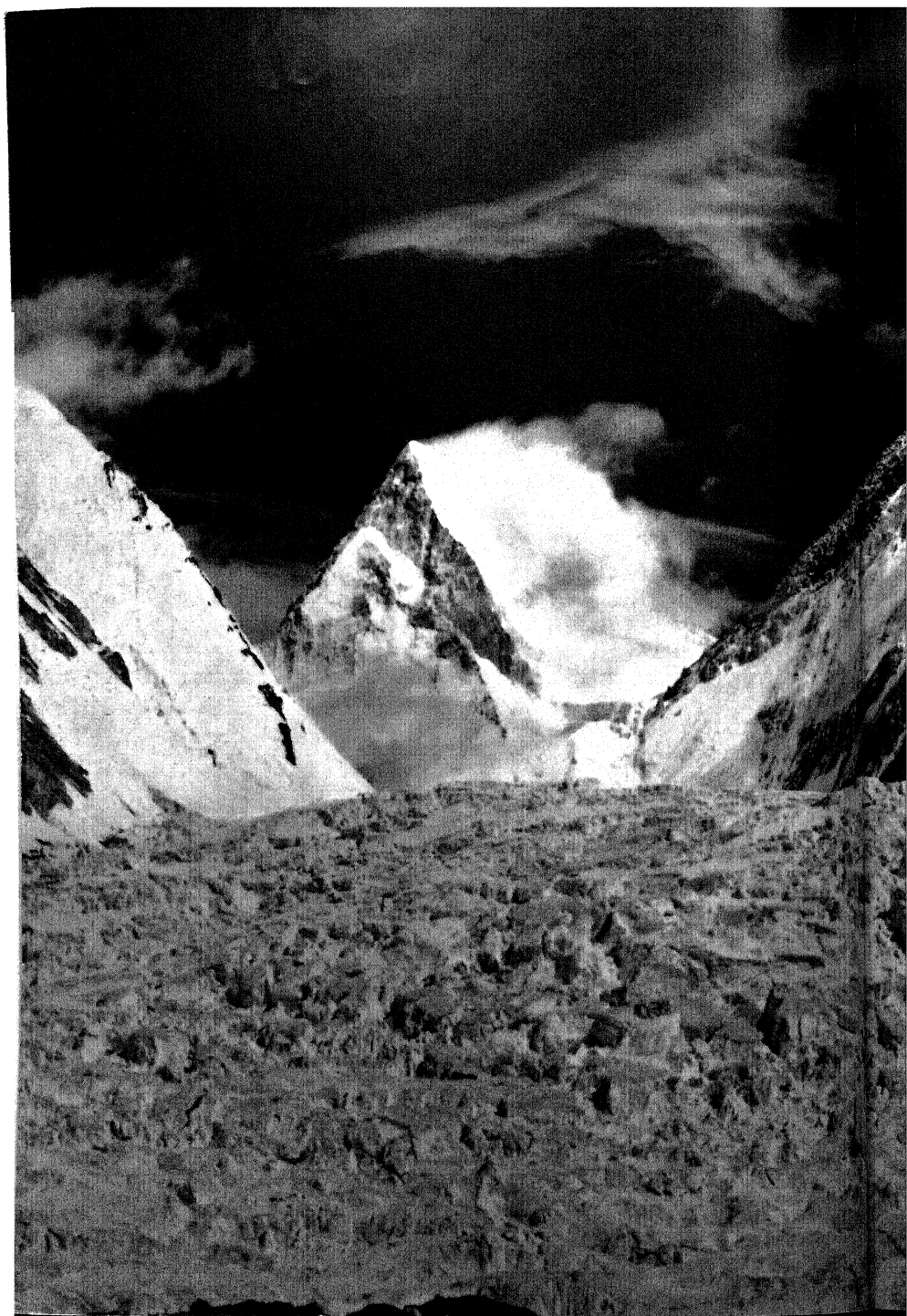
On July 15th an event took place which we all had been expecting for a long time, something in fact greatly overdue: the weather changed, the monsoon finally reached us. For three days, variously distributed in the camps upon the mountains, we waited, always hoping that the sun might prove more powerful than clouds and wind, but after some heavy snowfalls and a gale, in which it became clear that the very air we were breathing had changed, growing heavy, moist, sometimes ominously warm, Cassin ordered his men to the Base Camp for a period of rest and reorganization.

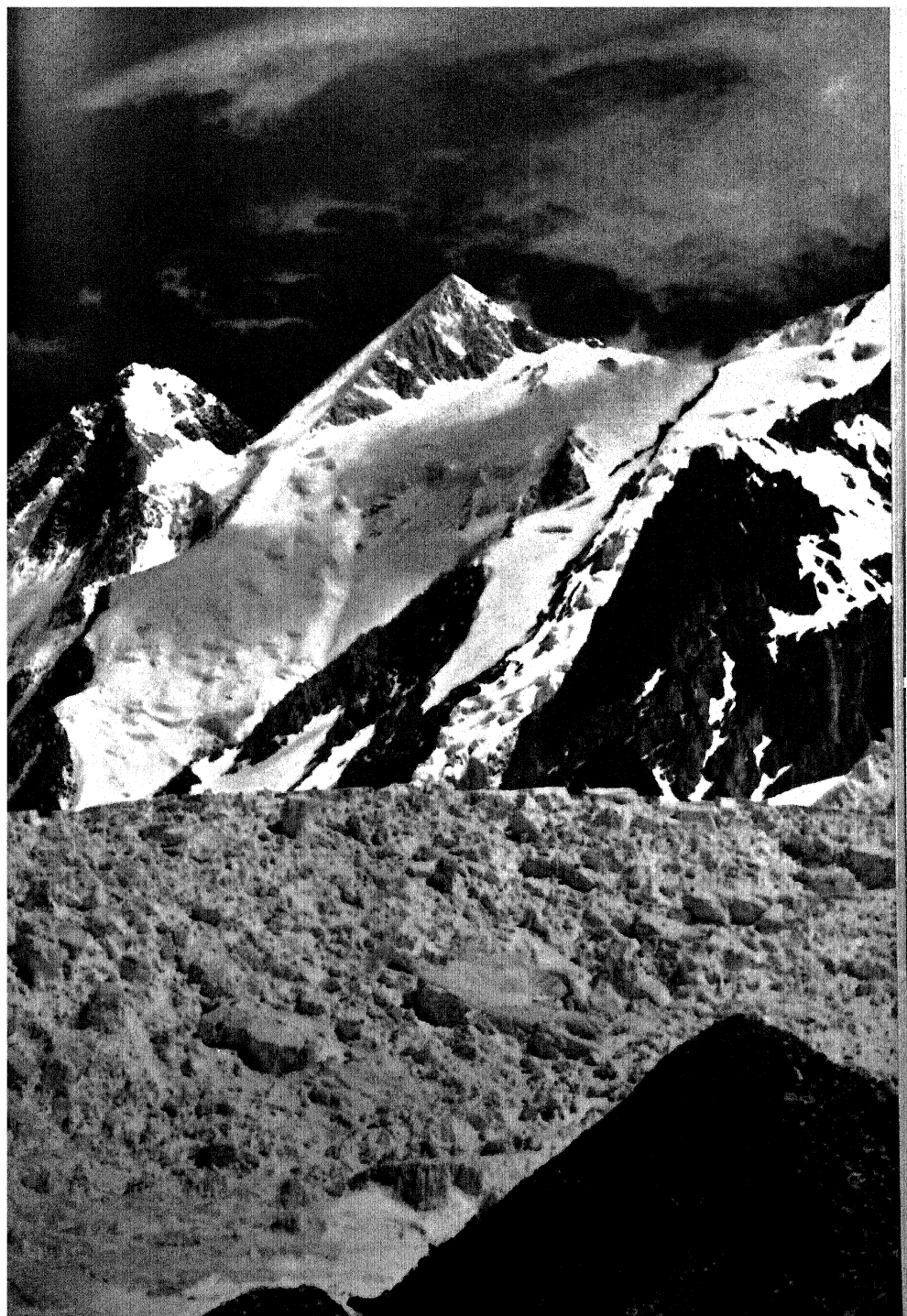
During a week, starting July 19th, we all took a much needed rest. The second assault, which was to start as soon as weather conditions improved, was studied very carefully by Cassin, Bonatti and Gobbi. Finally Gobbi wrote down

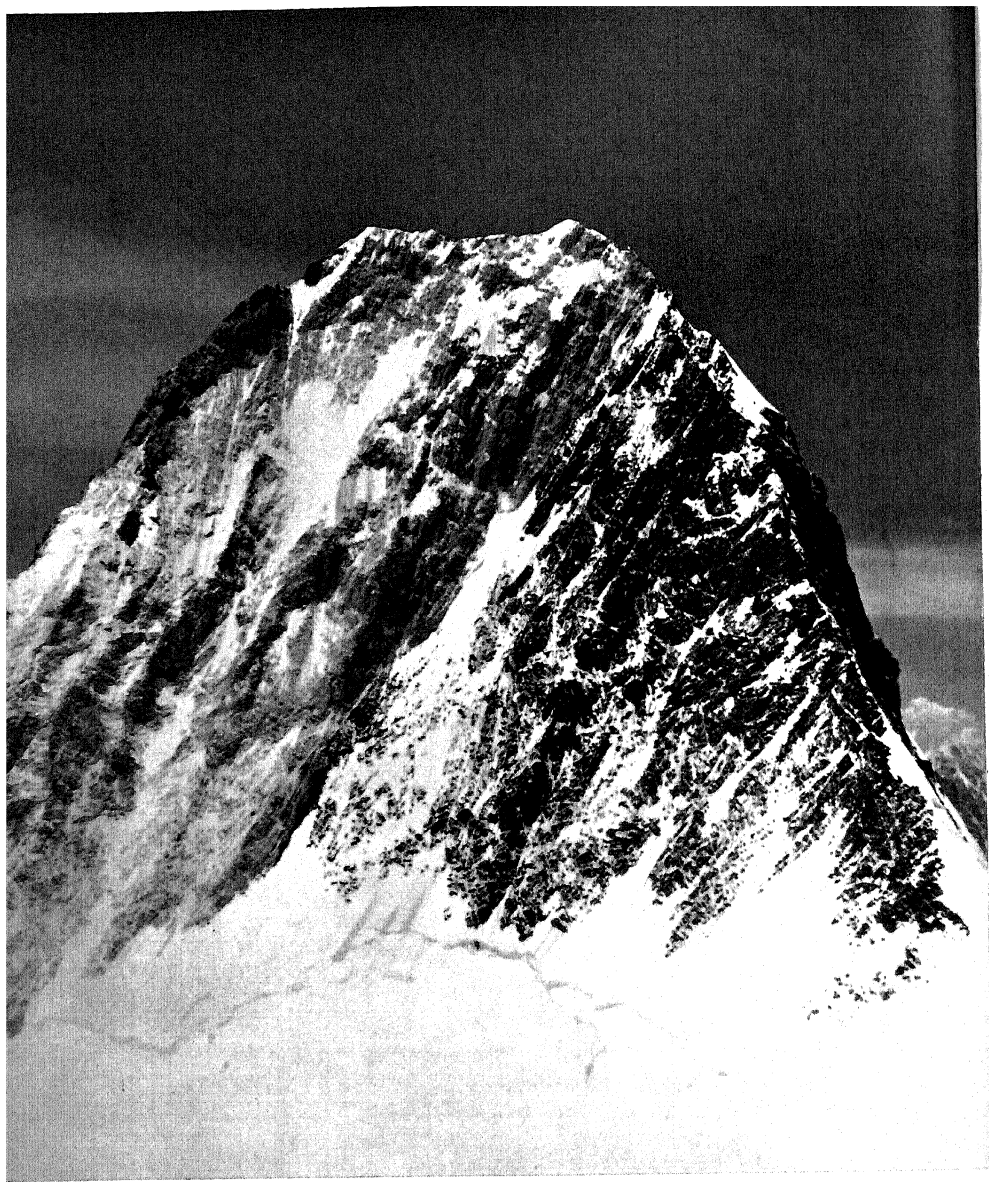


28 GASHERBRUM VI (22,970 ft.) seen from the Abruzzi glacier. Still unclimbed.

29/30 overleaf: GASHERBRUM GROUP with South Gasherbrum glacier from the south (Baltoro Karakoram). From l.t.r. G IV (26,170 ft.), G III (25,082 ft.), G II (26,500 ft.). (Photographs by Fosco Maraini)







31 SUMMIT PYRAMID OF GASHERBRUM IV (22,970 ft.) seen from the western side of G III. On the right the North-East Col. (Photograph by Fosco Maraini)

the actual time-table of everybody's movements, starting from an X day up to the moment of the final assault.

We were all severely handicapped by general fatigue and by exasperation, but we also had two great advantages over the mountain: we knew it thoroughly almost to the summit; we knew the moods of its glaciers, ice-falls and avalanches, and we had a string of five camps deployed along the (roughly) six miles from Base to north-east col. All members of the party, at one moment or other during the first assault, had reached the north-east col (7100 m.) and Capt. Dar moreover had climbed to Camp V (6900 m.) thus reaching one of the highest points touched by Pakistanis. All this gave us much confidence; at least when skies looked blue and our digestions were not upset by the subtle effects of great altitude.

The summer season of 1958 was better than normal. This was certainly one of the reasons why so many important expeditions succeeded in their efforts. The Americans reached Gasherbrum I, the Japanese reached Chogolisa, the British reached Rakaposhi, and the Austrians reached Haramosh; only a second British expedition to Minapin suffered an accident and had to retire. The monsoon is very irregular in the Karakoram. Some years (as in 1954) it reaches this region fully, bringing bad weather and storms for a long period; at other times (as in 1958) it makes only a short appearance around the middle of July.

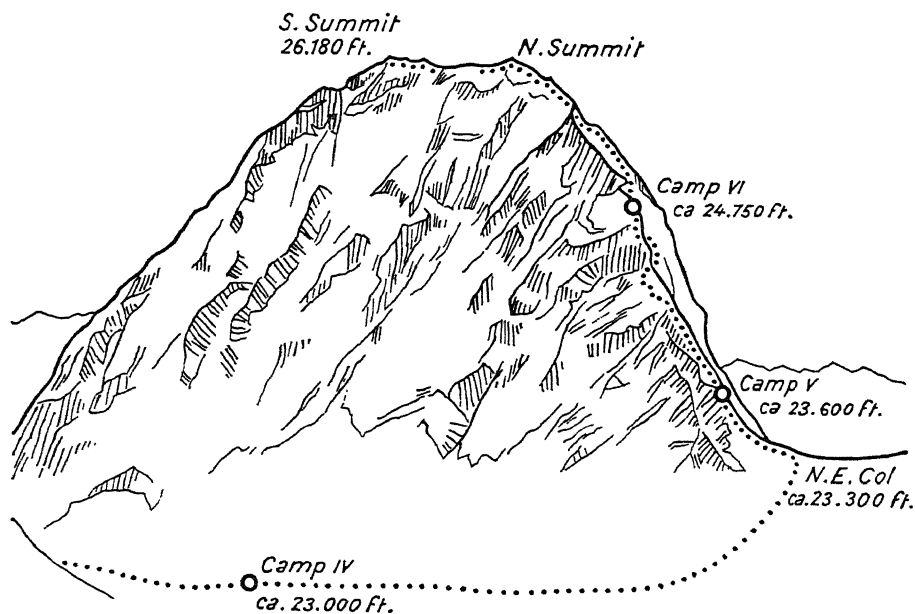
The Second Assault

On July 23rd the weather seemed very promising and Cassin decided to launch our second assault the next morning. A first week was entirely given up to refurnishing the higher camps; the actual attack on the summit would take place only during the second week. Oxygen was part of our equipment, and some bottles were to be carried up to Camp IV, but none were used.

Slowly, every day, men and food, men and fuel, men and ropes, tents, pitons, went up the long snow fields to the higher reaches of the South Gasherbrum Glacier. On August 2nd Camp V was reached again by Bonatti and Mauri, followed by Gobbi and Defrancesch. The morning after, two parties (Bonatti and Mauri on one rope, Gobbi and Defrancesch on a second one) climbed very slowly, but relentlessly, with excellent conditions of weather and snow, to a small ledge below the *Torre Ultima* ("the last Tower"), where Camp VI was pitched in a most precarious position. That same evening Gobbi and Defrancesch returned, by moonlight, to Camp V. Now Bonatti and Mauri were alone with the toughest assignment of their lives in front of them.

The morning after (August 4th) was clear but very cold. The two men slowly gathered their strength and their things, as is usual at great heights, managing somehow to leave camp at daybreak. With great effort they reached the further point touched on July 14th, then covered some new ground with many difficult passages, among others a smooth slab of the Vth grade. The effort sustained the day before, when they had carried heavy loads up to Camp VI, was now telling on them. The summit appeared again quite far away. They had to give up and return slowly to Camp VI, which was reached at sunset.

August 5th broke on the mountains of Karakoram as another splendid day of sunshine and blue skies. But the effort of the preceding days had been too great; Bonatti and Mauri had now to rest. Food and fuel were also running rather low. Bonatti was firm about taking no unnecessary risks. Fortunately, all other movements down below were going according to schedule; Gobbi and Defrancesch, this time together with Zeni, made an early start from Camp V carrying food, fuel, equipment and post up to Camp VI. The arrival of letters from home and families in faraway Italy had an excellent effect on the moral of our companions. When Gobbi, Defrancesch and Zeni descended again to Camp V the same evening, they were certain that "tomorrow will be G. IV day"!



Final pyramid of Gasherbrum IV from West (after F. Maraini)

On a Mountain with two Summits

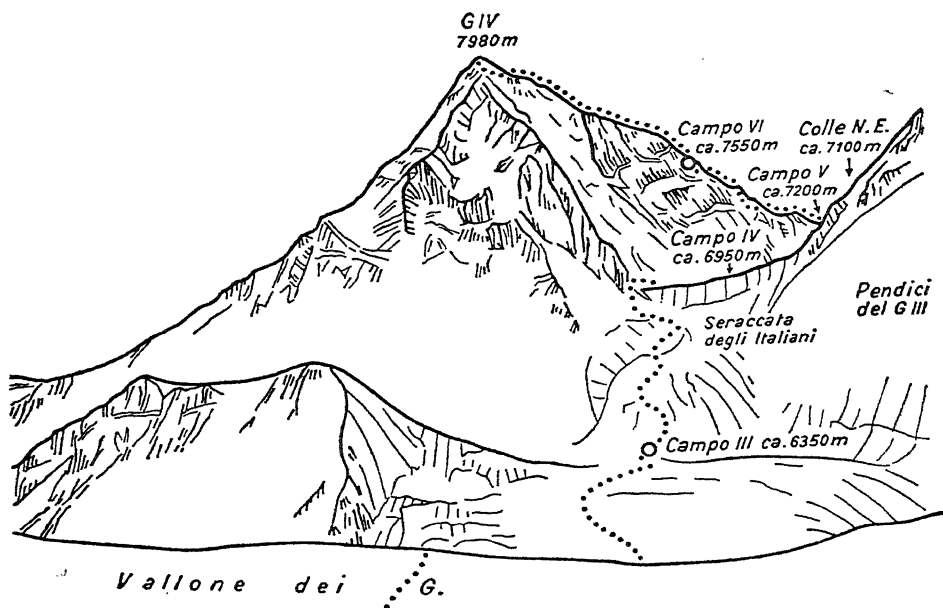
"It has been impossible for Bonatti and myself to sleep"—Carlo Mauri jotted down in his diary on August 6th. "It is not lack of patience or nervousness. But I wish everything was finished!" At 2.30 in the night an alarm clock rang in the lonely tent on the ridge. Many times during the night Bonatti and Mauri had looked out to the sky. The weather was not at all promising; sunset had been rather murky the evening before, and clouds were slowly creeping up the valleys. Another change of the weather was in sight. Till one o'clock the air had been ominously warm; then suddenly a sharp cold wind started to blow.

"It is nearly 4.30 and the wind gives no sign of calming down", Bonatti scribbled in his diary.

With great difficulty, because of the forbidding conditions, Bonatti and Mauri managed to creep out of their tent and fix their crampons. Soon, fortunately, the wind fell and the sun appeared, bringing some warmth. At 6 o'clock, barely an hour after they had left Camp VI, they set foot on the *Cono di Neve* ("the Snowy Cone"). It had generally taken them four hours to reach this same spot, so prospects were really bright this time.

At 7.30 they passed beyond the *Torre Nera* ("the Black Tower"), now covering virgin ground. Difficulties were not so great—relates Bonatti—but the very thin ridge, formed by black unsteady slabs of rock, was exceedingly dangerous. While clearing away some snow, a small cornice nearly dragged Bonatti into one of the bottomless precipices that surround the final pyramid of Gasherbrum IV on every side. At 9.10 the two men reached a diminutive col; here the black rocks of Gasherbrum IV are abruptly interrupted by the white marble-like limestones of the real summit. After overcoming a very tough chimney, the *Camino Bianco* ("the White Chimney"), fully of the IVth grade, the whole world seemed to open suddenly in front of the two climbers. Ten thousand feet bellow the Baltoro Glacier appeared like a prehistoric monster, whose scales were the moraines of different colours and textures. Over 30 km. of iceflow were visible at one glance; from Concordia down to Paiju. An unforgettable sight.

By 10.30 the two men reached what looked like the summit of Gasherbrum IV, only to discover that another summit, possibly higher, was there in front of them, about 300 m. further south. This was most disconcerting! The weather seemed to be changing and the ridge between the two summits looked anything but easy. Yet it was impossible to go back, saying: "Another time." "There being only a shadow of a doubt as to which summit was highest (wrote Bonatti), we could not



Gasherbrum IV from South-East (after F. Maraini)

return in our steps." So the small team went on, gasping for air, fiercely bitten by the cold wind.

The first part—a small snow field on the western side of the summit which they called the *Conca Lucente* ("the Shining Dale")—did not offer any serious obstacles; but the real summit of Gasherbrum IV turned out to be one of a series of gables and turrets, just as one finds in the Dolomites, but not near the 8000-m. line in the Himalayas. Some of the toughest rock climbing was performed here, with many passages of full Vth grade, on slabs so compact it was nearly impossible to drive any size of piton into them. Crampons were also a serious problem: yet the cold was such that the climbers feared taking them off lest it might prove impossible to refix them when needed during the descent. Some of the hardest stretches were overcome in the worst possible conditions.

"It is a desperate struggle", Bonatti noted in his diary; "yet finally we managed to win." At 12.30 on August 6th, 1958, the two men set foot on the highest point of Gasherbrum IV.

After the traditional ritual of flags and photographs, after "taking in the marvellous view with supreme satisfaction", Bonatti and Mauri started their descent. All around them clouds were gathering, great black pillows of cloud; a storm was overtaking the Karakoram. The first part of the descent resembled

one from a *Campanile* or a *Guglia* in the Dolomites; three rappels with an emergency rope were necessary to get down from the top-most cusp of the mountain. Then it became simply a race with the storm, which suddenly buried the mountain in mists, bringing snow and raging wind. With much difficulty Bonatti and Mauri managed to reach Camp VI late in the afternoon, fully thirteen hours after their departure. A terrific strain: but a great day.

Descent in the Storm

During the night between August 6th and 7th the weather deteriorated rapidly. When Bonatti and Mauri put their heads out of the small tent at Camp VI, they found themselves in the midst of a terrifying storm. Visibility was nil, the wind was blowing with utmost rage, carrying new snow and driving the old snow into whirling clouds of icy dust; the temperature was extremely low. They understood at once that to remain up there would mean death: apart from the cold, apart from the lack of food and fuel, if a lot of new snow were to fall on the mountain it might become technically impossible to reach the north-east col. It was imperative to descend at once.

According to Bonatti this descent in the storm was a fiendish adventure. "The most horrid hours I have ever lived on a mountain", he told us later when all was over. Miraculously the two men managed to grope their way along the ridge, down gullies and chimneys, often guided by the fixed ropes they had put up for the ascent some days before. "Most of the time I could hardly see my companion, who was only at a rope's length from me", said Carlo Mauri. And it was difficult to keep one's eyes open in the continual gusts of wind, among the clouds of pulverized snow.

In the lower camps all of us were anxiously waiting for the two men of the summit team, so it was with immense relief that Gobbi and Defrancesch greeted our companions at Camp V late in the morning of August 7th. During the afternoon both teams, still in a raging storm, descended to Camp IV, where they met Cassin and Zeni.

On August 9th, with a sunny sky at last, we all returned to Base Camp. Gasherbrum IV, dream, wonder and nightmare, was really over. Now we could rest.

Exploring Gasherbrum III and Gasherbrum La

While Bonatti, Mauri, Gobbi, Defrancesch and Zeni were concertedly active on the north-east ridge of Gasherbrum IV, other members of the expedition undertook various explorations on their own account.

On August 5th Riccardo Cassin, who was waiting alone at Camp IV, went out to explore the west face of Gasherbrum III. He managed to reach a height of about 7400 m., then was stopped by the girdle of steep rocks which divide the lower from the higher slopes of the mountain on its north-west side. Cassin estimated that one small camp beyond our Camp IV in the Cow's Cwm would be enough to conquer Gasherbrum III. Gasherbrum III is now the highest unclimbed mountain in the Karakoram range.

Cassin, from this new vantage point, took a series of very interesting photographs of Gasherbrum IV. Our mountain appears in them with a completely different and quite unfamiliar aspect. Gasherbrum IV, like the Matterhorn, is one of those giants that have many faces.

On the same day (August 5th) Oberto and Maraini set off from Camp II hoping to reach the 6748-m. col between Gasherbrums IV and V. They were stopped, however, by an excessively deep *Bergschrund* with an overhanging upper lip, about 100 m. from the ridge.

The day after (August 6th) the same team managed to reach without much difficulty the Gasherbrum La (about 6600 m.), an important depression in the ridge between Gasherbrum I (8068 m.) and Gasherbrum II (8035 m.). After climbing an ice-fall, similar in position and appearance to the other one ("*La Seraccata degli Italiani*") between Gasherbrums III and IV, but much easier, they slowly gained height along an open hanging valley, which was also very similar to the other one already described further west ("the Cow's Cwm"). The similarity in structure and general outline between the two ice-falls and the two hanging valleys, one leading to the north-east col (7100 m.) and one leading to the Gasherbrum La (6600 m.), turned out to be quite striking. They were both unknown until then and they push the watershed—as shown on maps—about a mile further north.

Gasherbrum La turned out to be not so much a col as a balcony. While on the southern side it is comparatively easy to reach, the northern side falls into the Shaksgam valleys with a fearful series of precipices covered with ice and snow. It is curious to notice that the hanging valley leading to the Gasherbrum La slowly turns from north to east, and the col finally faces almost due east. A group of very high mountains was easily visible in the distance: it may have been Teram Kangri, the giant discovered by Longstaff and considered for some time to be an "eight-thousander".

THE BATURA MUSTAGH EXPEDITION 1959

By John Edwards

The 1959 expedition to the Batura Glacier region of the Western Karakoram was unusual in several respects. With an average age of 25 years, the members were younger than on most Himalayan expeditions, and were perhaps symbols of the increased interest in climbing and the increased opportunity offered by such post-war institutions as the Mount Everest Foundation. The expedition was also unusual in that it included three different nationalities, being predominantly British with German and Pakistani members. In this we were perhaps ahead of our time as we felt that the lack of any clear nationalist objective cost us some support both in England and Germany.

In 1956 two young British climbers, Harry Stephenson and Richard Knight, studied the reports of recent expeditions to select an objective for a small Himalayan venture which they proposed to launch. The 1954 German Karakoram Expedition had attempted the 7785-m. unnamed peak which dominates the little known Batura Glacier, but their attempt had failed due to the lateness of the season. They considered the peak feasible, however, and as it promised a short portorage from the Hunza Valley caravan route it was selected as an objective for this expedition.

Long Alpine seasons had brought Harry Stephenson and Richard Knight into contact with many leading European climbers, and Martin Günnel, a prominent German climber and member of DAV and the Gipfel Stürmer Club, became interested in the project. During 1958 I joined the party as glaciologist and we also recruited Dr. Keith Warburton (Distaghil Sar 1957 and three Antarctic Expeditions) and another German, Albert Hirschbichler of Berchtesgaden (Eiger-Nordwand 1953). It was decided by the members that Dr. Warburton should take over the leadership of the party because of his greater experience.

The party was now a very strong one and during 1958 the organisation went ahead with advice and assistance from many leading British Himalayan climbers. We also received the support of the Mount Everest Foundation and the Royal Geographical Society and were honoured with the patronage of the Duke of

Edinburgh. Equipment was obtained from all over Europe by Harry Stephenson and was in all cases the best available. The rations prepared by Richard Knight, were calculated with the help of the best obtainable advice and were made up in three forms; approach march, low altitude and high altitude. They were packed in disposable lightweight, plywood boxes, each box containing rations for 12 man-days.

Dr. Warburton looked after the medical supplies and general organisation, while I attended to scientific and financial matters, while giving some help with the equipment. The two German members also helped with food, equipment and money. The expedition was financed largely by the members themselves, but we received substantial help from the Mount Everest Foundation. The generous assistance of many leading British firms was also invaluable in our preparations.

Although application to the Pakistani authorities had been made in July 1958, permission to visit the Batura Region was not received until mid-March 1959. After considerable last minute activity we sailed from Liverpool on April 11th for Karachi. On arrival in Pakistan we had some further trouble from the Pakistani authorities, who attempted to withdraw permission to visit the area, on political grounds. We managed to prevent this, however, after four days of protracted negotiations. In Pakistan we were joined by Jamil Sherjan, a former officer in the Parachute Regiment who was to be my assistant on the glaciological side.

We moved up to Rawalpindi by the Tez-Gam Express to prepare for the next stage of our journey, the flight to Gilgit. It was a great relief to get away from the humid heat of Karachi and our stay in Rawalpindi was made very pleasant by the hospitality of Colonel E.R. Goodwin, an old friend of Keith's with whom we stayed. Bad weather on the route to Gilgit made Pakistan Airways very reluctant to send their elderly Dakotas on the trip and we were obliged to join the queue of expeditions waiting for onward transport. The first arrivals had been the Italian Kanjutsar Expedition, an extremely large enterprise composed mostly of professional guides. They seemed a very strong party and we spent several pleasant evenings with them, although Martin Günnel was the only member of our party to speak Italian. The next arrivals were ourselves and we were followed by the Swiss Expedition to Disteghil Sar led by Raymond Lambert. The last arrivals were the German Karakoram Expedition led by Dr. Hans-Jochen Schneider. This party had wide scientific interests and also intended to make an attempt on Diran, a peak of the Rakaposhi Group lying above the village of Minapin.

In Rawalpindi we were also joined by our liaison officer, a young lieutenant of the 14th Punjab Regiment nominated by the Pakistani authorities. He had no interest in climbing and had been sent to us when he expected to go on leave and so viewed the enterprise with some distaste.

The weather on the Babusar Pass eventually cleared and after a wait of 17 days in Rawalpindi we were able to make the flight to Gilgit. This flight is well known to the many climbers who have passed through Gilgit in recent years, but no description can do justice to the magnificent views of the Karakoram peaks which it affords. Particularly memorable is a superb view of Nanga Parbat and the Silver Saddle rising some 12,000 ft. above the aircraft.

We had been in touch with the Mir of Hunza State during our preparations for the expeditions, and he had generously put his guest house in Gilgit at our disposal, and the airfield jeeps took ourselves and our stores along the dusty Gilgit lanes to what was to be our home for the next few days.

The cloud which had been the cause of our delay in Rawalpindi had been accompanied by torrential rain at Gilgit and this had so damaged the road to Hunza that it would take two days to repair. We were still behind the mammoth Italian enterprise in the queue for transport, and their baggage (nearly 18 tons of it!) would monopolise the available jeeps for some time, so that our stay in Gilgit would be at least four days. We spent the time in exercising on the surrounding hills.

Three of the four expeditions would be travelling on the Nagar side of the Hunza River. We were the only expedition with permission to climb in Hunza and we were relieved that we would not have to take part in the struggle for coolies and horses which would inevitably take place between the other three expeditions, a struggle which would be very wasteful of time and money.

The road was eventually deemed clear for traffic and at last we obtained nine jeeps which had been sent back by the Italians. The cost of a jeep for the 62-mile journey to Baltit was 200 Rs. with a load of about 750 lbs. Early one morning the jeeps drove into the shady, grass-covered courtyard of the Mir's guest house and we started to load up. There were the usual arguments about a "fair" load, but eventually everything was tied on and we pulled out distributing "baksheesh" to a crowd of importunate "chowkidars".

It became apparent as we left Gilgit that jeep maintenance was not of a very high order. The first jeep broke down just as we crossed the bridge after a brief and inglorious drive of some 600 yards. The other drivers explained that they could not wait as their radiators were leaking and they must reach the next

stream before the engines boiled. Each driver had an assistant who clung to a precarious perch on top of the swaying mound of boxes and kit-bags. His main function was to leap off as soon as we approached a stream and start filling the radiator almost before the jeep stopped. His other function was to jam rocks under the wheels as we reversed around hairpin bends on the more precipitous parts of the road.

The 7-hour journey from Gilgit to Baltit is a memorable experience. The road is rarely more than 7 ft. wide and snakes across the cliff faces with no parapet. As I was in the offside seat I was constantly looking down onto the wild brown waters of the Hunza River boiling over the rocks some 500 ft. below. The steering was uncertain and the drivers took all corners at the maximum speed. This gave the journey a nightmare quality which was not improved when they stopped to point out the mangled wreckage of a jeep which had gone over the edge two days before, killing the occupant.

As our jeeps rumbled through the narrow Baltit lanes and splashed across the irrigation channels, we had our first glimpse of the Hunza people. The Hunzas claim with pride to be descended from some of Alexander the Great's troops who left the victorious march into northern India to settle in this warm and fertile valley. Whether the claim has any foundation in fact seems doubtful, but there is certainly a European cast to the features of many of the people. The language of the Hunzas, Burachaski, is unlike any other Asiatic language and very few Europeans can speak it. One of the members of the German expedition was carrying out some research on this subject and we hoped that the blood samples taken from the natives by Dr. Warburton would serve to throw some light on the origin of the Hunzas.

The Mir of Hunza, an affable gentleman in Western dress, was waiting to greet us as we arrived and we were ushered into the "palace" to take afternoon tea with the Ranee. The Mir's palace, which resembles a villa in a better class London suburb, contrasts with the former palace, now only used on ceremonial occasions, a white fortress-like structure which dominates the village like a miniature Potala.

In response to the Mir's overwhelming hospitality we took all our meals at the palace during our short stay. Dinner, on our first evening, was a sumptuous affair of silverware and white linen, terminated with rose scented finger bowls. We felt most out of place in our travel-stained khaki drill. Some members of the expedition remained in Baltit for a few days to collect the blood samples, while the rest went on up the old caravan route towards the Chinese Turkestan border.

Our stay in the capital of Hunza was all too short, but we had an opportunity to see some of the workings of this model benevolent autocracy.

Our horses were now assembled for the next stage of the journey and we were obliged to leave. We had some 45 horses, each carrying 160 lbs and accompanied by their owners, most of whom also carried loads. We had recruited three prospective high-altitude porters in Baltit, Ali Gohar, Akbar, and Bul-bul, and these were a great help in organising the caravan. We decided that all members of the party should travel on foot carrying loads of about 50 lbs. so that we would be completely fit when we started to climb. The liaison officer refused to do this and ordered a riding horse. He would not even carry a rucksack, which he gave to one of the high altitude porters whom he regarded as his personal servants.

We found at this stage that the rate of pay of two annas per horse per mile which the Pakistani authorities had laid down meant nothing to our coolies who only reckoned by the traditional "stages", the length of which varies in a rather arbitrary manner. Our journey to Pasu at the end of the Batura Glacier was 27 miles but was reckoned as three stages, or three days march and for this they were paid an agreed rate of 6 Rs. per horse per stage. We did this journey in two days and in fact it can be done on foot in one day, but the rate of pay remains the same. Even at this price we counted ourselves lucky, as on the other side of the valley competition between rival wealthy expeditions had pushed the price of a good horse to something over 20 Rs. per day.

The road, or "rafiks", from Baltit to Pasu is extremely narrow and winds across cliff faces and rock spurs, rising or falling many hundreds of feet in the course of its wanderings. It is built out from the cliff face by jamming rocks into narrow cracks and then building upwards and outwards. Held only by gravity with no pegs or mortar, it is a marvel of primitive engineering. As the horses flanks hugged the cliff face and their hooves slipped over the stones of the road's surface we expected any moment to see one of our pack animals precipitated into the swift brown waters of the Hunza River below us.

We reached Pasu without a major disaster and here we waited for two days while the yaks needed for the next stage of our journey were assembled from the high pastures where they were grazing. The various loads were sorted, checked and weighed and in due course the courtyard of the dak bungalow, where we were living, was filled with some 40 yaks and their shouting and gesticulating owners. A yak rate of 6 Rs. per stage was again negotiated, but as there were no permanent settlements beyond Pasu, we would also have to feed the coolies.

We had purchased food from the army dump in Gilgit for this purpose, and we issued it on the journey according to the rates laid down by the Pakistani authorities. These proved to be far too generous and much time was wasted by coolies creeping off to hide what they could not eat so that they could collect it on their return journey.

Travelling as we were at the end of May, we were almost the first party of the year to go up the Batura Valley which, in some places, still had a deep covering of snow. The stages were therefore quite short and we anticipated that it would take about five days to reach Base Camp. For the first day's travel we started west up the Pasu Valley towards the towering terminal moraine of the Pasu Glacier, which flows eastwards from a small valley at the eastern end of the Batura Chain.

Before reaching the Pasu Glacier, we swung north and ascended a formidable series of nearly vertical cliffs of hardpacked glacier debris over 1500 ft. high. Here we saw for the first time the full value of the yaks who climbed without stopping along the steep narrow path which wound up the cliff face. The few horses we had retained because we could not get enough yaks, had to be unloaded at the bottom and dragged up by their owners. One horse owner carried the horse load on his own back over the more difficult stretches while dragging the horse behind him.

This moraine wall brought us into a gently sloping glacial valley which leads north and west to join the Batura Glacier at a point just behind the snout. It seemed probable that the Batura Glacier had once divided at this point, one branch flowing south-east to join the Pasu Glacier. The difference in height of 1000 ft. between this valley and the present levels of the Batura and Pasu glaciers would seem to indicate that this was a very long time ago.

At the northern end of this valley, another steep slope of tight packed glacial debris leads down to the ablation valley which lies on the southern side of the Batura Glacier. At the top of this cliff were some small stone huts which were used as overnight stopping places for people travelling with their flocks to the grazing grounds further up the valley, and here, at Yuntz, we stopped for the night.

The Batura Glacier, one of the four or five greatest glaciers in the world outside the polar regions, now lay stretched out before us. At this point it was some 2000 yards across, the surface a mass of formidable ice hummocks thickly covered with moraine debris except for a straight thread of clear ice which came from the massive ice-fall which was our destination. We could not yet see the ice-fall itself as it lies some way back from the main body of the glacier.

The day's rations, including an 80-lbs. bag of "atta" or coarse flour, were handed over to the coolies and Akbar, who had proved himself a competent if unimaginative cook, prepared some "chappatis" for us, to go with our own meal of soup, stew, cheese and biscuits.

The next three days travel included a crossing of the glacier to avoid some tributary glaciers on the south side. Here again the yaks showed their usefulness and their instinctive ability in ice-climbing. They would casually leap crevasses with 200 lbs. on their backs or traverse a steep slope by kicking the sharp edges of their hooves into the ice. They were also very good at route finding and it was rapidly appreciated by the expedition members that the best way to get over a piece of difficult ice was to follow the nearest yak.

Three days travelling from Yuntz brought us to Putmahal, a similar unoccupied group of huts lying in the broad northern ablation valley of the glacier, an amazingly flat piece of ground about 600 yards across, between the smooth rock of the mountain and the ridge of the lateral moraine some 80 ft. high which marks the edge of the glacier. Across the glacier from this point lay the ice-fall, the first and major obstacle to the ascent of the principle peak of the Batura Chain. We had now to cross the intervening two miles of partially snow-covered glacier to select a suitable site for our Base Camp among the masses of old moraine ridges lying in the "V" between the bottom of the ice-fall and the main body of the glacier.

At this point our coolies decided to strike. They said that they had never crossed the glacier at this point before and it was too dangerous. We went out to the middle of the glacier and found the conditions much the same as at the first crossing, but the coolies refused even to look at the crossing. After half a day of negotiations we found that the cause of the strike was the fact that some of the leaders felt that they were now far enough away from the village headman to try and force some pay increase out of us. Provided the pay was right, they would cross the glacier without any qualms. We were relieved but at the same time slightly saddened to find that even in Elysium the demands for pay rises could be heard.

We settled down to a day of slow negotiation trying not to appear impatient, but at the same time we drastically cut the rations as an incentive for the coolies to reach an agreement with us.

In financial negotiations, the rural simplicity of the Hunzas dissolved to reveal hitherto unknown depths of Byzantine cunning. It was difficult to realise that normally they do not see money from one year's end to the next. Eventually

a price of 12 rupees per 80 lbs. load across the glacier was agreed upon, and we started to move off, having lost two days through the strike. The time had not been entirely wasted however, as we had been able to examine the mountain and possible routes to the top, and also had had an opportunity to see the usual courses of the frequent avalanches and plan a route to avoid them.

Base Camp would be at about 11,000 ft. and from it we would have to find a way onto the 7000-ft. high Batura ice-fall. This ice-fall was flowing downwards at rates varying from 6 to 12 ft. per day and the surface was consequently very unstable. There were frequent lines of séracs to be negotiated and at the higher parts of the ice-fall these seemed to be in a dangerous condition, particularly in the early morning when they frequently started falling in large numbers soon after the sun reached them.

Above the ice-fall an extensive gently sloping snowfield which nourished the ice-fall extended back westwards for two or three miles until it reached the foot of a rock wall some 3000 ft. high, which was continuously swept by avalanches. The southern end of this wall was also the scene of avalanche activity and so it became apparent that it could only be tackled at the northern end. Here a small ice-fall provided a natural stairway to the plateau above the rock wall. A mile or so back from the top of the rock wall lay the twin peaks of the summit, rising abruptly about 4000 ft. from the surrounding plain like some Arctic nunatak.

Although the climbing party would be opposite the north face of the summit when they emerged from the upper ice-fall, they would have to circle round and attack it from the other side, as once again the avalanches made a direct assault impracticable. Whether they went round east or west would have to be determined when they got there, but from the ground the eastern end looked promising. To take this end, however, would mean that they would have to traverse the ridge between the two peaks, as the more distant western peak was the higher of the two.

As the peak was 25,540 ft. in height and Base Camp 11,200 ft. a considerable number of intermediate camps would be required. Allowing an average figure of about 2000 ft. per camp we would need six camps. The lower camps would probably be spread rather wider than this and the upper ones would be closer together. We particularly wanted to avoid a long climb from Camp VI to the summit as we were of the opinion that final camps are often put too low down, causing assaults to fail in the last lap. We did not want anyone to have to emulate Hermann Buhl's Nanga Parbat climb and so aimed at putting Camp VI at 24,000 ft.

A further point that had to be considered was that camps could not remain long on the main ice-fall because of the danger from séracs and crevasses and therefore the climbing party must establish an advance base well stocked with food and equipment above the ice-fall and would be cut off from the lower Base Camp during the assault. They would also have to rely on their own efforts to get down again. This had been appreciated before we left England and so we had abandoned the idea of wireless. A receiver alone would only supply Pakistani weather forecasts and we had gathered from other expeditions that these were less reliable than a barometer on the spot. The weight of a receiving and transmitting set could not be justified when every ounce mattered, as nothing could be taken up to or brought down from the snowfield without the climbers doing it themselves.

The three high-altitude porters were to accompany the climbers to the snowfield advance Base Camp to help ferry 28-days supplies for the five climbers to this point. They were then to return down the ice-fall, bringing the ice-fall camps with them and would help Jamil Sherjan and I with the glaciological work which we would be carrying out on the Batura Glacier. After the assault, the climbers were to descend direct to Base Camp. The generous margin of supplies at the advanced camp was to enable them to "sit out" any possible bad weather, as a descent of the ice-fall in bad weather would have been a dangerous undertaking.

This then was the plan, but all did not go as expected.

Base Camp was established on June 4th, and while the stores were still being ferried over the glacier Albert and Harry started on the ice-fall to find a good route and a suitable site for Camp I.

We intended to keep to the north-west, or "upstream" side of the ice-fall, as the southern side was continually swept by avalanches. Every day some four or five avalanches broke away from the edge of a snowfield at the top of a 6000-ft. rock face which dominated the lower part of the southern side. The snow clouds would sweep across the bottom of the ice-fall at about 50 miles an hour, but would break up before they reached us at Base Camp. We had the added protection of our 100-ft. wall of lateral moraine between us and the open ice. The north-west side was affected by frequent rock falls and a few small avalanches on the lower parts. The séracs and crevasses of the centre were obviously impassable, so that our initial choice of route was somewhat limited.

It consisted essentially of sticking to the north-west side and striking a not

very happy balance between the Scylla of the séracs and the Charybdis of the rock falls.

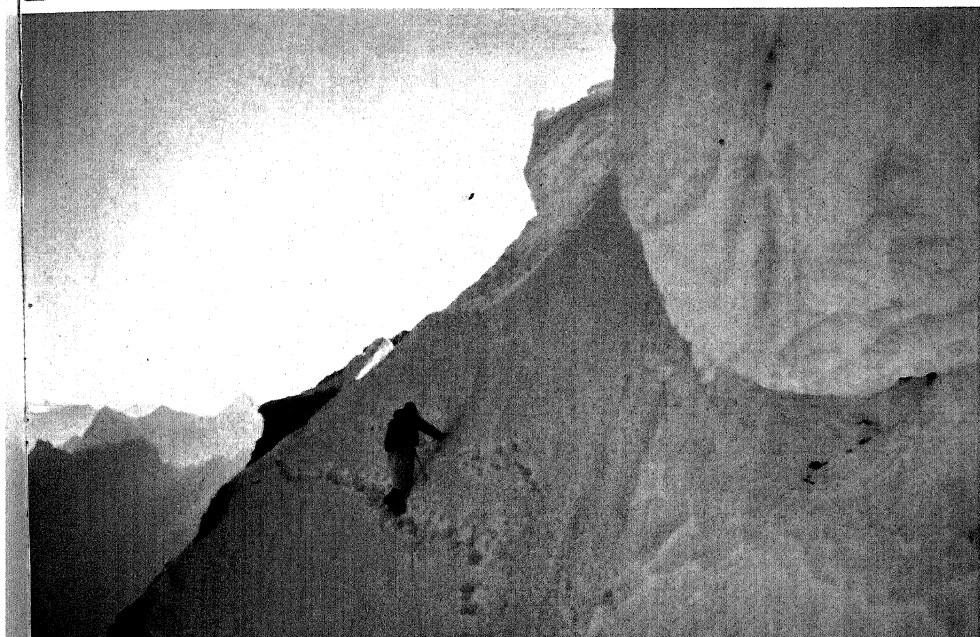
Camp I was established at about 13,000 ft. on a sérac in the turbulent area at the side of the ice-fall, where the moving ice came into contact with the "dead" ice of old avalanche slopes. Access to the camp was by way of one of our lightweight aluminium ladders, and in fact the camp itself was intended to serve as a bridge onto the middle of the ice-fall, as at this point the séracs appeared less formidable.

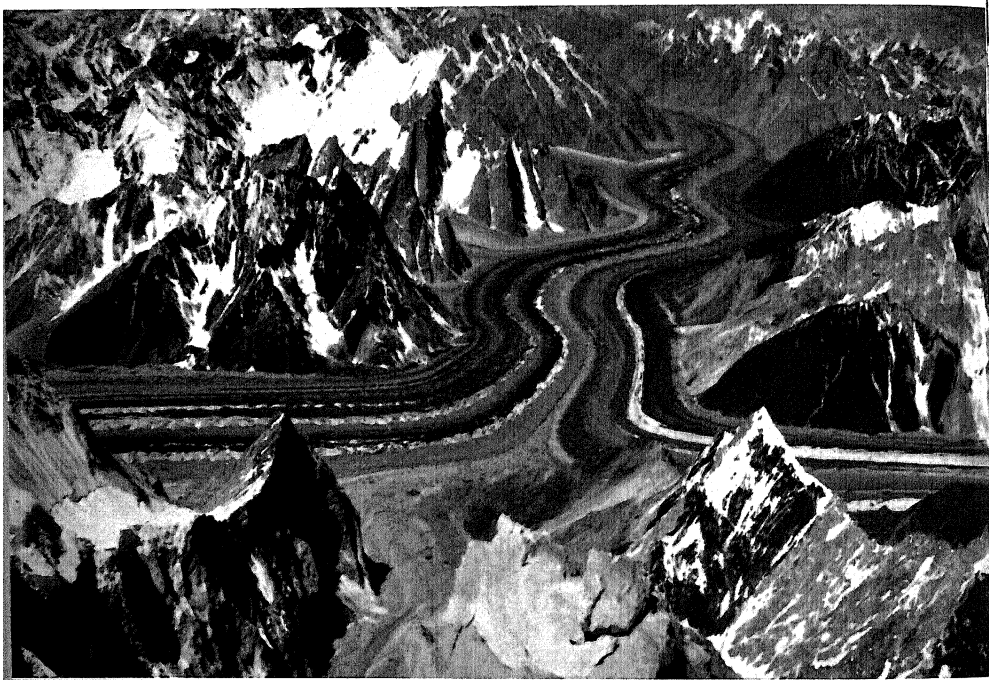
As the spring thaw progressed rapidly we were able, after a few days, to find a better route to Camp I. A long climb up the slopes above the Base Camp, where the first flowers were breaking through the thin covering of snow, brought us to the beginning of a long rock traverse which was above most of the worst rock falls. The rock face was interspersed with several nearly vertical ice-filled gullies which provided some interesting and stimulating climbing. Across the most dangerous of these we fixed ropes, as they proved somewhat hazardous when carrying a large load. From the end of this traverse, a short ice-climb over a few séracs brought us to Camp I.

During the next few days, Keith and Albert established Camp II at 16,000 ft. in the middle of the ice-fall and the others, with the porters, were busy stocking these two camps. I had twisted my knee during the approach march and I did not do much climbing during these early days but started on the erection of cairns to act as reference points during my glaciological observations.

With the establishment of Camp II, Dick and Martin moved into Camp I to ferry to Camp II, while Albert and Keith prospected a route through the dangerous upper sérac area at the top of the ice-fall onto the snowfield where Camp III was to be established at a little over 18,000 ft. Meanwhile Harry, Jamil and the porters were ferrying to Camp I. To get 150 man-days of food and fuel, together with a large amount of equipment up to the top of the ice-fall was a formidable undertaking, but now everything was moving up steadily. We were particularly fortunate in having Albert and Keith as our "path-finders" through the bewildering maze of séracs and crevasses. By June 9th, just five days after we arrived at the Base Camp site, they had selected a suitable spot for Camp III, but the hard work of ferrying remained to be done.

Life at Base Camp was not without its excitements, and on June 12th I was just getting up at 5.30 a.m. when I saw some snow begin to break away at the top of the 6000-ft. rock face opposite the Base Camp. The biggest avalanches always occurred just after sunrise, but this one promised to be larger than usual.





32 preceding photograph, top: STORM APPROACHING during descent of Italian party from summit of G IV (22,970 ft.) to Camp IV.
bottom: DELICATE TRAVERSE on the north-east ridge of G IV. (Photographs by W. Bonatti)

33 top: VIEW FROM NORTH SUMMIT of G IV, looking towards the south (highest) summit (26,170 ft.). In the background Chogolisa (25,100 ft.).
bottom: BALTORO GLACIER, seen from G IV (near summit). (Photographs W. Bonatti)

The large swirling snow cloud crossed the three miles of ice in less than two minutes and did not break up or swing away but came straight for the Base Camp. I called to Jamil, who was still asleep, and he put his head out of his end of the tent, but when he saw the snow cloud suddenly extinguish the sun as it loomed over us he tried to get back into the tent again.

He was still struggling with a jammed zip when the cloud hit us. The tent immediately filled with snow and was then flattened with more snow on top. The cloud had been silent during the latter part of its approach, moving swiftly and ominously like an animated piece of thick fog, but inside it there was a tearing, shattering, roar. It passed over us quite rapidly and when we extricated ourselves from our tent we were faced with a scene of desolation. Our big mess tent had disappeared and with it had gone some newspaper articles I had been writing, together with all my glaciological notes. We found the tent over one hundred yards away, buried and torn but with its pneumatic tube supports still intact and inflated. We re-erected the tent and repaired the tears with sticky patches before searching the surrounding area for the next of our belongings and equipment.

The avalanche made a good talking point when the rest of the party returned to base.

Soon after this incident the weather deteriorated. The clouds came down to 16,000 ft., and we were subject to frequent rain showers, with snow at Camp II. The porters descended from Camp II, to which they had been ferrying, and returned to Base Camp. They had neglected to take up spare socks and they declined to wear the canvas overboots with which they had been provided, so that they were all suffering from cold wet feet and were feeling miserable. Ali Gohar, who had assumed the leadership of the three because he was the only one to speak fluent Urdu, started complaining about their equipment and making ridiculous demands for down trousers (they already had some down jackets) and high-altitude boots. Ali Gohar was a very excitable individual and shouted at Bul-bul and Akbar in Burashaski until they followed him in refusing to work any more until their demands were satisfied. Here they were adopting much the same tactics as the coolies and "striking" when they considered themselves to be indispensable. We found subsequently that Ali Gohar had been thrown out of the army for trying to start a mutiny, so he was obviously no stranger to this form of agitation.

The porters' equipment, sleeping bags and air mattresses were, of course, completely adequate for the heights they were intended to reach and in fact far

superior to porters' equipment issued on many recent expeditions. Jamil Sherjan went to 18,000 ft. with rather less equipment than the porters and suffered no discomfort at all. The liaison officer who had remained in Base Camp was of little use in resolving this situation.

Keith returned during these negotiations and we decided that we would have to sack the porters, so we sat down and calculated their pay for the three weeks they had been with us. We considered that they should return the equipment with which they had been issued so that we could equip other porters if we should need them. This they refused to do and there was no way short of force by which we could get it back. We offered to pay one of them to return to the villages and get clothing for the other two, but this they also refused. They were obviously determined to retain the clothing, which they valued greatly in spite of their complaints. We calculated the resale value of the equipment and this came to over £ 20 per man, almost double the pay due to them up to this stage, so we told them that they would receive no pay until the equipment was returned. They again refused and, gathering up their (or, rather, our) belongings, they left us, with Ali Gohar screaming hysterical abuse which, perhaps fortunately, we could not understand, and the other two following, silent and a little bewildered, in his wake.

With the porters gone it looked as if we might have to alter our original plan of action, but instead we decided that the glaciology programme would be temporarily shelved and Jimmy and I would join the climbing party as far as Camp III. The high altitude porters had refused to carry more than 45 to 50 lbs. and, as the members of the expedition usually carried 55 to 60 lbs., the substitution of two "sahibs" for three porters should not prove to be a drawback. Indeed, when the simplification of the rations was taken into account it should be a distinct advantage.

Over the next few days, the whole party lifted the last of the necessary stores from Base Camp to Camp I. We then did the same thing up to Camp II. A typical ice-fall day would start at Camp I with the alarm clock ringing at 2.15 a.m., followed by a shout to wake the cooks, Dick and Martin, who were sleeping in a slightly larger tent than the rest of us. This was consequently used for cooking and eating. They would light a couple of paraffin stoves and put on a couple of pressure cookers packed with snow to make the morning coffee and porridge. This, together with biscuits spread thickly with margarine and jam, formed our breakfast.

While porridge was being prepared, the rest of us would drag ourselves out

of our sleeping bags and grope in the darkness for our boots, overboots and down jackets, before emerging into the bitter cold to walk the few steps to the comfortable warmth of the mess tent. All seven of us would somehow get in and, by the light of a couple of candles, breakfast would be hurriedly consumed. A swift wipe round the dishes with a paper handkerchief or a handful of snow and everything would be ready for the next meal.

Crampons were not allowed into tents because of the potential danger to tent fabric, air mattresses and down clothing, so the next thing was to find your crampons, massage the frozen straps and buckle them with chilled fingers onto the huge, down-insulated high altitude boots.

By about 3.30 a.m. the loads we had made up the previous evening would be shouldered, the lunch packets issued and we would be off in the dim light, slowly climbing among the séracs and crevasses of the ice-fall towards Camp II some 3000 ft. higher. At 4.00 a.m. the first rays of the sun would strike the peak of the Batura Mustagh far above us. The ice-covered cone tinged with pink would suddenly stand out with startling clarity against the intense dark blue of the sky behind and we would perhaps pause for a moment to capture some of the vast lonely beauty of this strange world in which we climbed.

As the sun rose higher, the edge of the shadow would gradually creep down towards us and from the crisp freshness of the early morning we would suddenly be plunged into the full heat of the day. The frozen snow underfoot, which had given a firm bite to the crampons, would become mushy, so that boots were sinking and sliding, and anoraks and sweaters would rapidly come off we would be climbing in shirt sleeves. The purpose of the early start was to do as much climbing as possible before the sun added to our difficulties.

Our progress towards Camp II would become slower as tiredness, heat and altitude began to take effect. The first time I made the 3000-ft. ascent to Camp II it took me seven hours. The first 1000 ft. in 40 minutes and the last 30 in 20 minutes. Towards the end of the climb I timed myself "flat out" at 20 steps to the minute, with a long rest every two minutes. After three days I suddenly became acclimatised and could do the journey comfortably in just over three hours.

At Camp II we would rest for about two hours and then go down again to Camp I, arrange our loads for the following day and prepare supper at about 4.30 p.m. This was usually stew in our biggest pressure cooker, augmented by our own specialities; cheese and H. P. sauce, mashed up and spread on biscuits, or a mixture of Martin's, prepared from snow, crushed glucose tablets, lemonade

powder, sugar and milk powder. It was supposed to resemble ice-cream. After supper we "undressed" to the extent of removing our boots, and by six, we would all be well down in our sleeping bags. This routine was followed for four or five days, until all the necessary stores were at Camp II.

Between Camp II and the snowfield plateau was the "sérac line", the most formidable obstacle on the ice-fall. A great forest of ice-pinnacles and crevasses formed as the smooth sheet of the snowfield tipped over some rocky precipice far under the ice and started the long descent to the glacier. The séracs were liable to come crashing down without warning, and the most dangerous time was just after sunrise, when the thunder of falling ice was almost continuous.

Albert and Harry marked a route through this one morning with long strands of red wool. With a superb piece of ice-climbing they fixed a rope ladder to the top of a smooth, overhanging ice-wall, 80 ft. high, which was the only way onto the snowfield. The rest of us were engaged in ferrying all the stores up from Camp II to a depot camp at just over 17,000 ft. at the lower edge of the séracs, ready for an early morning dash through.

The following morning we were up very early and soon had the stores on their way to the bottom of the ice-wall. Albert and I went up the ladder, which was a long and exhausting business, then we hauled up the equipment and the other members. I was not encouraged when a neighbouring sérac collapsed as I was halfway up the ladder. We had not had much time to spare.

By 8 a.m. everything was on top of the sérac, with only a short ice-climb between us and the plateau where we were to put Camp III. As we sat down to an early "lunch" of glucose, chocolate, raisins and snow we felt very happy. We had overcome one of the greatest ice-falls in the Himalayas, and the expedition team had been tempered and sharpened both physically and mentally by the struggle, so that it was ready for whatever lay ahead. The way up looked hard but not as hard as the route behind us, and we felt confident that we had turned the key to Batura. It only remained to open the door.

Our first impression of the plateau was of wind. A hard bitter wind drove clouds of sharp ice-crystals into our burnt faces as we stumbled onwards with our heads bent against it. The surface was a sea of smooth ice-hummocks, more like the Arctic than the Himalayas. In the lee of one of these hummocks, about two miles from the top of the ice-fall, we found the "Mountain" tent which Keith and Albert had left there ten days before. It was now buried in snow, with only the tops of the poles visible. Here we dug in Camp III. We now had 30 days' food, paraffin and equipment for five men at a height of over 18,000 ft. It was time

for Jamil and I, the two honorary porters, to leave for Base Camp and the delayed survey work.

As we waved goodbye to the small but cheerful band busy "digging in", Keith called out: "See you in two weeks if all goes well." A few hundred yards, and the black dots were hidden by the ice-hummocks when we looked back. We never saw them again.

By about 6.30 p.m. Jamil and I had got back to Camp II, where a tent, a stove, and some food had been left in case of an emergency descent. We found that the stove refused to work, so we had to resign ourselves to cold stewed steak for supper. The main hardship was the lack of anything to drink. The following day we went on down to Camp I, where we collected all the remaining stores and equipment and put two aluminium ladders in a previously arranged spot in the "calmest" part of the ice-fall, so that the climbers would be able to use them again to get off the ice-fall on their way down.

Our own way down without the ladders was now rather difficult and we had to climb back up the ice-fall for several hundred feet until we could find a way through the maze of séracs and crevasses at the side, onto the relatively smooth slopes of ice left by old avalanches. We tried several routes before we found one which looked promising and we thought again of the almost uncanny skill of Keith and Albert in finding routes on the way up.

Our eventual choice was not without its difficulties, and the first of these was a series of crevasses very close together. Crossing these Jamil slipped and I heard a muffled shout of "Belay!" as he disappeared over the edge. My ice-axe was already fixed to the rope between us and I drove it into the hard packed snow just as the rope sprung taut. Jamil was uninjured and had only fallen a few feet before coming to the end of the rope, so it did not take long to haul him out. A little further on I lost my footing on an ice-slope and was just sliding into a crevasse, braking furiously with my ice-axe, when I was halted by a belay from Jamil. I climbed slowly back up the slope and we resumed our journey to the comparative safety of the side of the ice-fall where we continued the descent across the old avalanches slopes.

We were cutting steps across one of the steeper slopes when we heard a dull rumble far above us. Before we looked up, we knew what it was—a stone fall! It was obvious that we were directly in line with the fall. We were roped together, balanced in tiny foot holds we had cut in the smooth ice which fell away beneath us to the maelstrom of twisted séracs below. There was little we could do except press ourselves against the ice and make ourselves as small as possible. I looked

up just before the fall reached us and saw a large rock bounce a few feet above me; then I felt a sharp blow as it struck my rucksack. A few more close thuds, and it was over, with Jamil and I both unhurt.

We continued the traverse in a rather subdued frame of mind and eventually reached the cairn at the beginning of the long rock descent where we had left our other boots. The high altitude boots and crampons were exchanged for our normal climbing boots and we descended the rock face. At about 6 p.m. we stumbled into Base Camp very weary indeed.

Life at Base Camp was quite uneventful for the next few days as Jamil and I busied ourselves erecting cairns to act as reference points, and putting out lines of orange flags for speed measurement across the bottom of the ice-fall, in holes prepared with our special ice-drill. The frequent avalanches often disturbed our markers and we had to give up some of the ablation measurements we had hoped to carry out.

On July 2nd, after the barometer had been falling steadily for 24 hours, it started to rain. This soon turned to snow, and Jamil and I stocked up the mess tent, ready for a long siege. We did not leave the tent again until July 5th, when we dug our way out through 4 ft. of snow. At one stage the tent was collapsing regularly every two hours, because of the weight of snow on top. We would bang the canvas until the snow settled at the side and the tent would then spring upright once again.

Time passed slowly as we lay in our damp sleeping bags reading, writing, or perhaps just watching a drop of condensation form at the top of the tent and slowly creep down the wall. We often thought of the climbers, perhaps caught at 22,000 ft. or on their way down after a successful assault. We were confident that they would come through this trial as they had come through so many trials before.

Eventually the barometer climbed back from the depths, the snow stopped and we emerged blinking into the watery sunshine. The routine at Base Camp continued much as before, broken only by the arrival of the dak runner. From him we learnt that great damage had been caused in Hunza by the bad weather, a sudden change in the path of the monsoon, which had not happened for 50 years.

Jamil and I spent long periods surveying away from Base Camp, and when we returned from one of these on July 18th, we were rather surprised to find that the climbers had not yet returned. There were many possible explanations for this, however, and we were not greatly disturbed. The following day it

clouded over and seemed to be snowing in the region of Camp III. The climbers would not be able to descend in this and we settled down to wait as the cloud cover descended almost to Base Camp.

The conditions on the ice-fall were deteriorating rapidly, as Jamil and I had found when we made a return trip to Camp I to rescue the last of the equipment there. The descent with loads of 70 or 80 pounds had been most difficult. The new snow was soft and in places waist deep, disguising crevasses under a smooth even blanket. Jamil had slipped into a crevasse because of this and had been suspended by his rucksack straps as the ladder he was carrying jammed across the top of the crevasse.

The cloud lifted for a few hours on the 22nd, and we went as far as we could up the rock wall overlooking the side of the ice-fall, but a long search with binoculars failed to reveal any sign of a camp or movement. July 26th dawned bright and clear, and we spent the whole day on the glacier, watching the top sérac line for signs of movement. "They must surely move onto the ice-fall today", we thought; but there was only the still silent mass of tumbled ice to be seen. Something disastrous had obviously happened. We would have to go up if we could, but we had no light tent or stove at the Base Camp. Everything had gone up with the climbers. We would have to try and find help elsewhere.

On July 27th I set out for Pasu to get onto the telephone and see what help I could get from other expeditions in the area. I travelled with Buri, one of our two mail runners, and we travelled fast. The journey from Pasu to Base Camp had taken us six days, but now, although much of the path had been washed away by the monsoon, we did the return journey in 13 hours. It was quite dark when I limped into Pasu, but I managed to rouse the "lambadar" or headman, and I was soon talking to the Mir on the telephone, a primitive army instrument which links all the villages from Gilgit to the frontier.

The Mir referred my request for assistance to the Pakistani Political Agent at Gilgit, who rang me back to say that no one would be allowed to come to my assistance on "security grounds". As an afterthought he added that permission might be obtained from Karachi, but this would undoubtedly take three weeks!

Ignoring this further example of bureaucracy gone mad, I tried with the Mir's assistance to get in touch with the other expeditions. First I tried the Germans, as I knew that some of them had been on the 1954 German Expedition which had visited Batura and therefore would be more familiar with the ice-fall; but they were out of reach of the telephone, so I sent them a letter by runner, and the Mir promised to put me in touch with the Italian and Swiss parties the

following morning. After sending a letter and telegram to our expedition's home agent, I retired to bed for the night.

In the morning I found that my left foot had become very swollen and painful, so that I could not get my boot on and had difficulty in standing up. The lambadar produced a sharp and very dirty knife and was obviously in favour of immediate surgery, but I demurred.

The Mir came on the telephone at about 9 a.m. I spoke to Dr. Marimonti, the English-speaking member of the Italian Expedition, who was at the village of Nagar across the river from Hunza, but he could do nothing, as he was alone and had no equipment. I then spoke to Madame Lambert, wife of the leader of the Swiss Expedition, Raymond Lambert. The Swiss were in some difficulty themselves at the time, but they very kindly lent me the tent and equipment which I needed. The Mir of Hunza arranged for a relay of runners to bring the equipment throughout the night and I received it early the following day.

While I was waiting, I was visited by Shah Mohammed, the hunter, and I questioned him closely about his sighting of the climbers. He told me that four days before the very bad weather he had been hunting for ibex on the northern side of the valley, high above Putmahal and opposite the ice-fall. Early in the morning he had turned his binoculars on the summit of Batura and had seen a track with two figures on the shoulder of the eastern peak. He said that the figures seemed heavily loaded and were climbing slowly. He had watched them for over three hours, until they disappeared over the shoulder. We had always found Shah Mohammed most reliable and like all hunters he had very good eyesight, so there seemed no reason to disbelieve his story. But to make sure I made a sketch of the summit and he indicated the spot where he had seen the climbers by making a cross. This shoulder was a place we had discussed as a possible site for Camp VI, as it lay well clear of avalanches and only 1500 ft. or so from the top. Counting back from the bad weather brought us to June 28th or 29th, some six days after we left the climbers at Camp III. It seemed quite possible that they would have been on the point of establishing Camp VI by this time, and as they had four more days of clear weather it seemed very likely that they climbed the last 1500 ft. and had been on their way down when the bad weather arrived.

My foot had subsided a little by the time the equipment arrived, and with some bandaging I was able to get my boot on and left immediately for Base Camp with two coolies to carry the equipment. I was obliged to go rather slower now and the return journey took a day and a half.

At 3 a.m. on July 31st, the morning after I reached Base Camp, Jamil and I left for our attempt on the ice-fall. My foot was now less painful, but Buri, the dak runner, came with me to the rock face to help with my rucksack. The sun reached us as we got to the end of the rock wall and were just putting on our high altitude boots for the snow. Nothing was to be seen of our old route and the smooth ice at the side had largely disappeared, leaving us the choice of smooth, downward sloping rock slabs or a sea of nearly impossible crevasses and séracs.

We started on the slabs but travelled slowly. Eventually this became too difficult and we returned to the ice. We struggled over the ice for hours, wriggling over delicate snow bridges or cutting steps across steep slopes. The going now became more difficult, and in the late afternoon we were halted at the brink of a 150-ft. wall of ice. We had not the equipment to get down it and there seemed no feasible way round it. We had reached within 2000 ft. of Camp III, but we could go no further. There were no signs of life from the tumbled mass of ice above us and we were now certain that our friends were dead.

We felt very helpless and there was nothing else we could do except return to Base Camp, but for a few moments we knelt in the snow in silence, remembering the friends who had gone from us. I thought of Keith Warburton, on whose experience and quiet confident "leadership by consent" we had depended so much; of Harry Stephenson and Richard Knight, who had worked for this expedition for so long, testing and trying themselves in the Alps, and of the many weekends of training and planning I had spent with them in the English Lake District; of Martin Günnel, who climbed like a poet, overflowing with a shining boundless idealism, who always selected the heaviest load for himself when we were ferrying; and also of Albert Hirschbichler, probably the greatest climber of the team, whose apparently inexhaustible strength had been an inspiration to us all, and who had that rare gift of humility not often found in climbers of such eminence. To have known and lost such friends was indeed a terrible blow.

As I looked up at the gleaming purity of the snow, some lines of verse by Henry Vaughan came into my mind:

They are all gone into the world of light,
And I alone sit lingering here,
Their very memory is fair and bright,
And my faint heart doth cheer.

Without another word Jamil and I shouldered our rucksacks and began the long weary climb back to Base Camp.

On August 4th we left Base Camp to begin the long sad journey home, but between Pasu and Baltit we met four members of the German Expedition who had come to our aid: Gerhard Klamert, Dr. Gottfried Neureuther, Erwin Stocker and their liaison officer. We explained to them that there was nothing they could do, as we had not been able to climb the ice-fall and the fresh snow which had fallen since we left Base Camp would have covered any traces or remains of Camp III, even if we could reach the snowfield; but they felt that having come so far they were now committed and could not return without at least making a gesture. Klamert, who had little respect for the climbing abilities of Jamil and myself, said that he would easily be able to climb the ice-fall as he had climbed it late in the season of 1954. He also wished to take some photographs to supplement those taken on that expedition. As they were adamant I said that I would return with them while Jamil took the rest of the equipment and our liaison officer back to Rawalpindi.

We sorted out some of our equipment for me to take back and the Germans were most impressed with our specially designed down jackets and windproof suits and also the down-insulated high altitude boots and overboots with which we were equipped. Klamert said that he wished the German expedition had been similarly equipped.

During the return journey my foot again became swollen and Dr. Neureuther opened it and cleaned out some infection. This meant, however, that I could not walk or climb, so I told Klamert and Stocker the locations of the various camps and waited at the Base Camp with Dr. Neureuther for their return. The porter they had taken with them came back during the day and reported that they were finding the going difficult, and Klamert was very sick. Eventually they returned to Base Camp. They had not been able to get any higher on the ice than we had, but had climbed a little way up the rock wall. From there they had taken many photographs but had seen no signs of tracks or camps. I returned with them to Gilgit and then went on to Rawalpindi and Karachi to start the long, sad journey home.

What happened on the Batura peak must remain a mystery, but the most probable explanation is that the climbers were waiting in Camp IV or V for the weather to lift when they were caught in the tremendous avalanche activity which followed the monsoon storm. We do not know for certain whether they reached the summit, and therefore, within this narrow definition, the expedition must be accounted a failure.

The chance vagaries of Himalayan weather which turned near-success into

catastrophe cannot however detract from the fact that a body of young men of three different nationalities succeeded in launching a major expedition equipped and supplied to an extremely high standard. In spite of our different origins, we reached a unity of comradeship, outlook and purpose which is seldom met within expedition teams, and on this strong foundation we carried out our aims as far as fate would let us.

GERMAN KARAKORAM EXPEDITION 1959

By Hans-Jochen Schneider

Aims and organisation

The north-western section of the Karakoram joins the mainfolded mountain culmination of Central Asia. The peculiar characteristics of the North-Western Karakoram are derived from its central position between the desert-like dry highlands of the Pamirs to the north and the monsoon-drenched mountain wall of the Himalayas to the south which makes it a paradise both for the climber and the scientist. The summits of the ice-clad precipices of the main chain, the Batura-Mustagh, which soar to nearly 7800 m., have so far defied the few attempts made on them.

In 1954 the German-Austrian Karakoram Expedition led by Mathias Rebitsch carried out an extensive exploration of the area, coupled with a systematic scientific research (2, 4, 5)¹. The most important task was the establishment of an up-to-date map of this extremely glaciated area (3, 6, 7), thereby carrying on the 50-year-old tradition of German exploration in Central Asia.

Our present task was that of terminating this work begun in 1954 and also of supplementing it. The expedition therefore had a scientific basis and was not concerned with climbing any particular peak, although the climbing members of the party were to be given the chance of attempting to scale at least one of the numerous mountains in the area. In order to avoid unnecessary marches and especially the transporting of heavy loads, it became necessary to make an exact delineation of the various duties to be performed.

As some of the climbers had undertaken certain specific scientific tasks, it was not necessary to split up the team into two sections. This becomes obvious from the following list of participants and their various duties:

Dr. Hans-Jochen Schneider, 36, leader. Member of 1954 expedition. (Geology, geophysics and glaciology.) *Engineer Rudolf Bardodej*, 47, climber. *Surveyor Hans Baumert*, 45. (Geodetics and cartography.) *Dr. Hermann Berger*, 33. (Ethnology,

¹ Figures in brackets refer to the bibliography at the end of the article.

anthropology.) *Willy Bogner*, 50, accompanied the expedition at his own expense. *Gerhart Klamert*, 35, deputy leader, climber. Member of 1954 expedition. *Fritz Lobbichler*, 33, climber. (Zoology and botany.) *Dr. Gottfried Neureuther*, 45, climber and expedition doctor. (High altitude physiology and anthropology.) *Erwin Stocker*, 31, climber.

The following joined the party in Pakistan:

Sabib Shah, surveyor from the Survey of Pakistan. (Cartographer and liaison officer of the expedition.) *S. A. Rauf*, meteorologist from the Meteorological Department of Pakistan.

Like all German undertakings of this sort, our expedition was sponsored by the German Alpine Club and the German Exploration Society. The organization and coordination of the very extensive preliminary work was in the capable hands of the German Himalaya Foundation.

Without the very active support of the competent Pakistani authorities we would have found it quite impossible to carry out successfully our very varied programme of work. The eagerness on the part of our Pakistani colleagues and all others concerned to assist actively our cause was quite remarkable, far exceeding European standards of hospitality.

Towards the middle of May, the expedition arrived at Rawalpindi accompanied by about six tons of luggage. Up to now everything had gone according to plan. Here, however, we ran up against our first difficulty. An unusually severe period of bad weather had cut off all communication by air with Gilgit. Three other large expeditions had been impatiently waiting for good flying weather for some days, and all of them were also going into the Karakoram. However, this Gordian knot was solved as soon as the weather improved, thanks to the indefatigable efforts of the Pakistani transport authorities.

At last, by the end of May, we were able to leave Gilgit northward-bound for the mountains and glaciers of the Karakoram massif.

Attempts to climb Diran (7273 m.)

The basin of the Minapin Glacier is shut off to the south by a huge and savage ice wall over 3000 m. high, extending for 15 km. eastwards from Rakaposhi (7788 m.). Just before its eastern end it sinks down to a col at about 5900 m. and then rises sharply to a huge ice dome, called Diran².

² The name is derived from a shepherds' settlement in the Upper Bagrot Valley at the south foot of the peak.

The 1954 expedition had shown that the peak could not be scaled from the precipitous south face from the Bagrot Valley, but that it was most probably accessible from the north by way of the high col mentioned before. The glaciation of this face culminates in a very crevassed hanging glacier which descends more than 2000 m. down to the upper basin of the Minapin Glacier at an average angle of 30 to 40°.

Inspired by the results of the 1954 expedition, a British 4-man team, led by Ted Warr, made an attempt on the summit via the high col and was able to set up a camp higher up the ridge. Unfortunately both Warr and Hoyte did not return from their bid for the summit and were never seen again. After this disaster the small expedition called off any further attempts.

The great "icefall step" on Diran is the key to a successful ascent, as is the case with all northern faces in the high Karakorum Range. This 2000 m. high face, however, quickly becomes a death trap as soon as heavy snowfall augments the normal daily quota of avalanches, or when during hot summer days the hanging glaciers starts moving downwards and breaks off. When these conditions arise, there is no spot safe from avalanches on this treacherous flank.

Early in June the climbing party advanced to the upper basin of the Minapin Glacier and found a relatively safe site for Base Camp at about 3900 m. on a snow shoulder above the orographic right bank. Fourteen high-altitude porters ferried the necessary loads up the glacier from the valley camp of Tachafari (3300 m.). The loads had been carried to Tachafari so rapidly from the village of Minapin by the 80 Nagar porters, that the climbing party was able to assemble at the foot of the mountain with unexpected speed.

From Base Camp it was possible to get a good view of the route up to the col and the summit ridge of the Diran. As the summer was not far advanced there was still a thick covering of winter snow overlying the mighty icefall, but the wide scars left by avalanches clearly indicated the best route for further ascent. A poorly defined rather flat ridge led upwards from left to right from the upper basin of the Minapin Glacier to about the middle of the ice wall. The gully lying behind it swallowed up all avalanches falling from above it. There were a few very steep ice steps and crevassed zones higher up, but apart from these, the top part of the face right up to the col seemed to be fairly free from anything falling from above. Large numbers of crevasses either tended to slow down or engulf the avalanches.

At the beginning of June the icefall had not yet awakened to its full summer activity, although it had now begun to show signs of stirring. From both sides

of the glacier continuing from early morning until late in the night came a rustling and rumbling which became the accompanying music during the long upward climb.

Both climbers and porters were in excellent condition and were impatient to get started. A succession of fine days enabled them to make good progress up the icefall. Camp I (4800 m.) was established at the top of the ridge on June 4th. A cave was dug in the snow close by the tents, as a protection against avalanches in bad weather. During the next few days good progress was maintained. While all the equipment for the summit push was being carried on upwards, Camp II was set up in a crevasse at about 5400 m. This was to be, however, only a temporary station. On June 8th Stocker and porter Kabul climbed on upwards to break a trail towards the summit. They had barely reached the col when thick mist came down and the wind rose, bringing driving snow in its train, which forced them to retreat quickly.

The weather turned so bad that all high camps had to be abandoned the next day, and the whole party re-assembled in Base Camp. The snow, however, even followed them down there, with several tents collapsing under its weight. Avalanches were also soon rumbling down menacing the "safe" Base Camp.

There was obviously no sense in waiting under the present conditions and the party returned to the valley camp at Tachafari on June 14th. By this time the snow had partially turned into rain. But here there was no room for so many people, since almost all the gear was either on the mountain or at Base Camp, so, frozen stiff, wet and despondent over the unexpected set-back after such a good start, everybody went on down to Minapin, except Bardodej and Klamert, who stayed on as a sort of advance party for the next move upward.

While in Minapin, Berger was able to carry out his ethnological duties, at the same time acting as postmaster and leader of the support party. The villagers gradually overcame their shyness of the tape recorder and some very interesting anecdotes and local folklore were recorded in the vernacular (Shinah).

However, the period of relaxation had now come to an end. While the climbing party busied itself in and about the rest camp, the "stragglers", Baumert, Rauf and Schneider, had arrived. The three had recently finished their field work in and around Chalt.

On June 18th, a great religious festival, known as "Id", took place. The evening before it was still raining hard, so on the advice of the ever resourceful Sahib Shah, we acquired a sheep which he suggested we offer as a sacrifice to propitiate the weather gods. "Oh, well", we shrugged, "why not, it can't do

any harm..." Thus the sheep was duly slaughtered and roasted. Even as the sahibs and porters sat down for the feast, the rain suddenly ceased and the sun actually made its appearance!

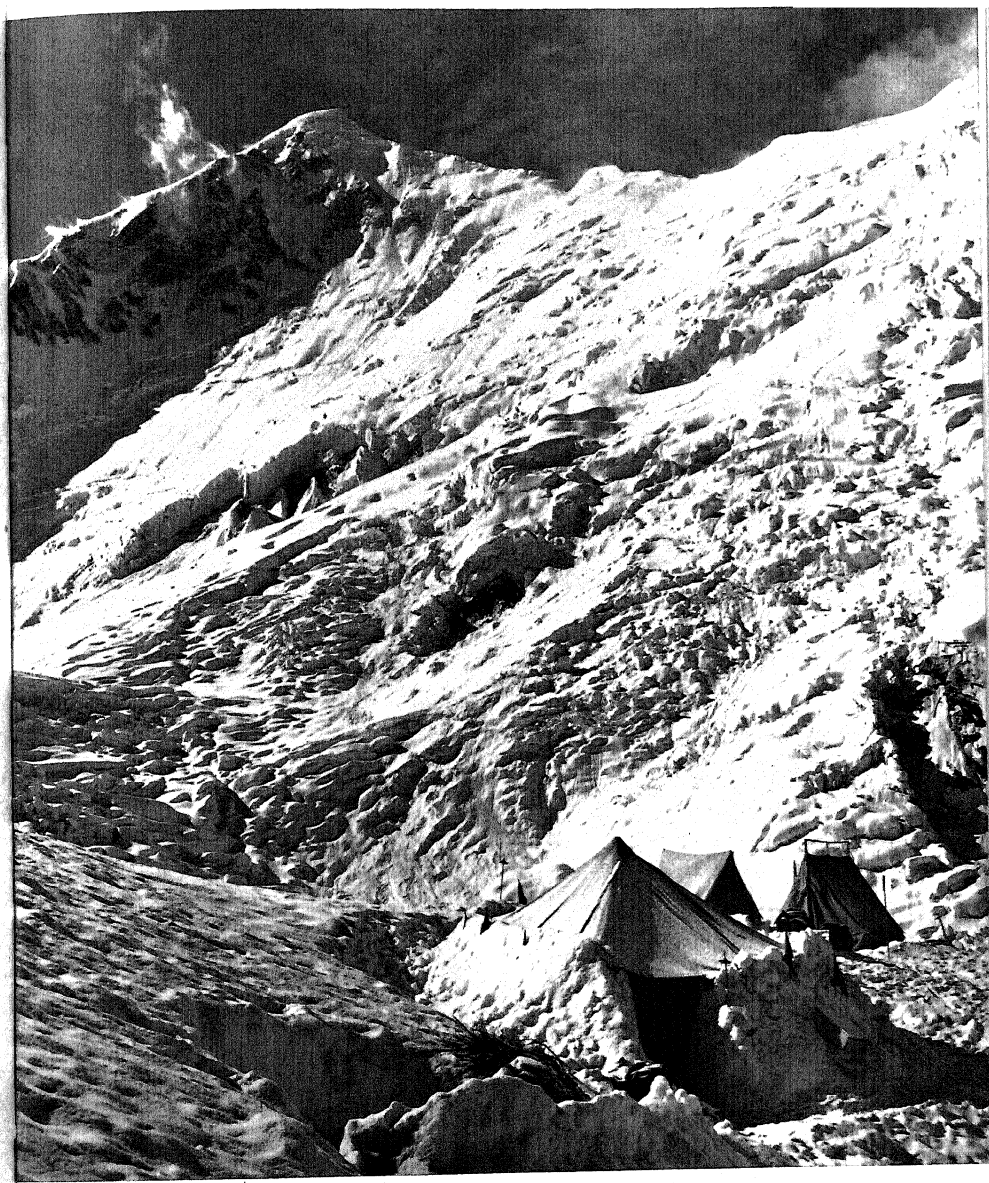
Anybody is welcome to supply a meteorological explanation for this phenomenon!

The appearance of the sun set off unusual activity in the camp. Early next morning, Lobbichler and Stocker and a party of porters re-ascended to the Tachafari camp, which Bardodej and Kabul had just left on their way up to Base Camp, while Klamert remained behind to await the arrival of Lobbichler's party.

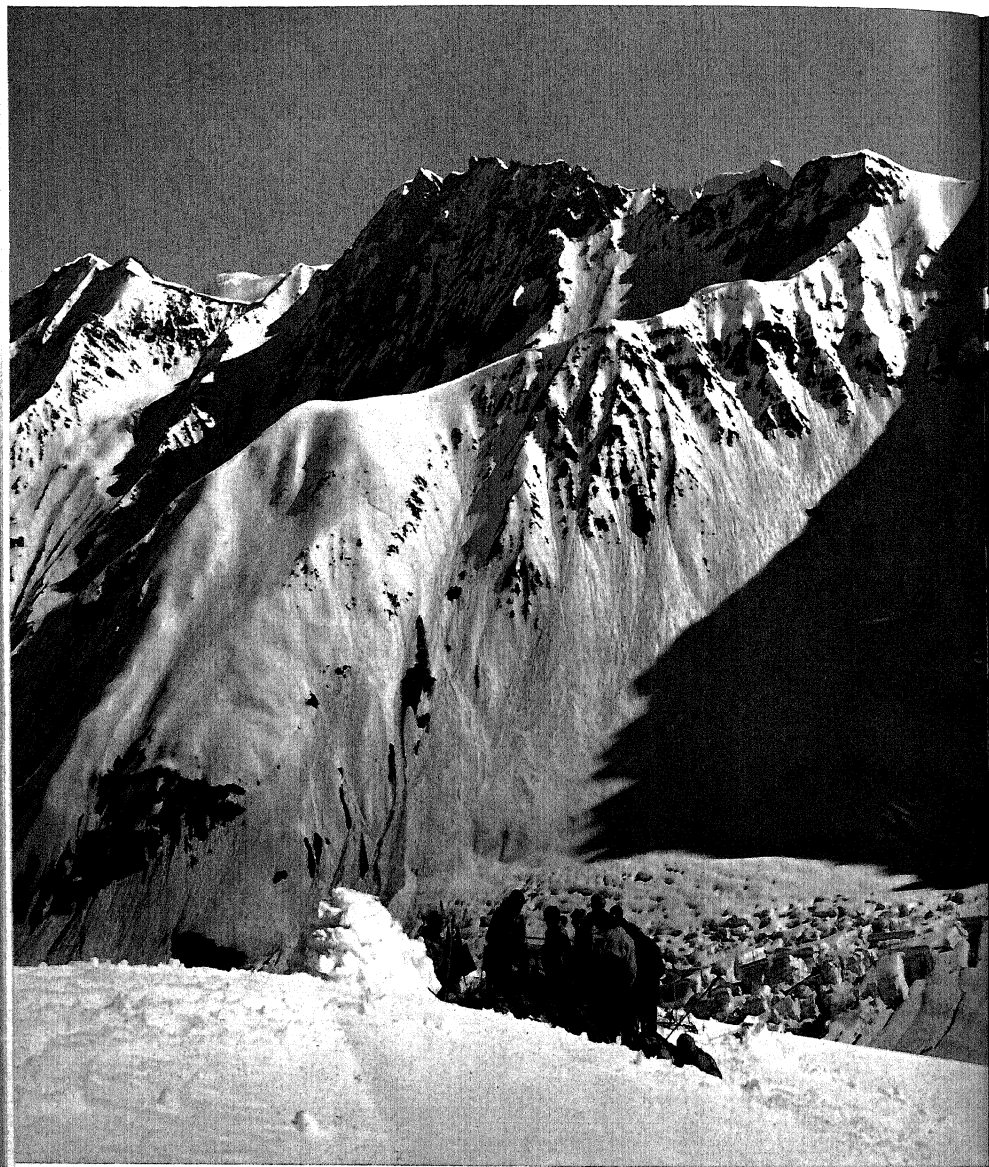
Bardodej found Base Camp deep in snow and many of the tents had collapsed. But now the sky was clear and Diran, mantled in glistening white, lured them on. They reached Camp I on June 19th, which they also found buried deep in powder snow, but practically undamaged; only one tent had collapsed. All the new snow avalanches had come down and the route seemed safe again. The next day Bardodej and Kabul reached Camp II. Here the damage was greater. One of the tents was completely buried and the contents appeared lost for ever. Bardodej erected a new tent on a small ice ledge and now had only one left over for the camp on the arete. The next morning, however, he saw that a large party had arrived at Camp I and therefore decided to go on to the col. The weather was sunny and cloudless, and there was almost no wind. Just the weather for a push for the summit! In the meantime, Neureuther had arrived at Base Camp with the porters and the rear guard, consisting of Berger, Rauf and Schneider, were in the Tachafari camp.

Klamert and two porters again set up and occupied Camp I, while Stocker and two more porters reached Camp II, where they deposited heavy loads. As most of the previous equipment here had been buried or swept away, he was obliged to await further loads before he could join Bardodej on the col. He spent the rest of the day, therefore, in tunneling through the snow into the buried tent in an attempt to rescue the equipment. In this he was only partly successful. Meanwhile, Bardodej and Kabul had reached the col and climbed above it to about 6000 m., where they put up a tent in a small depression on the summit ridge of Diran.

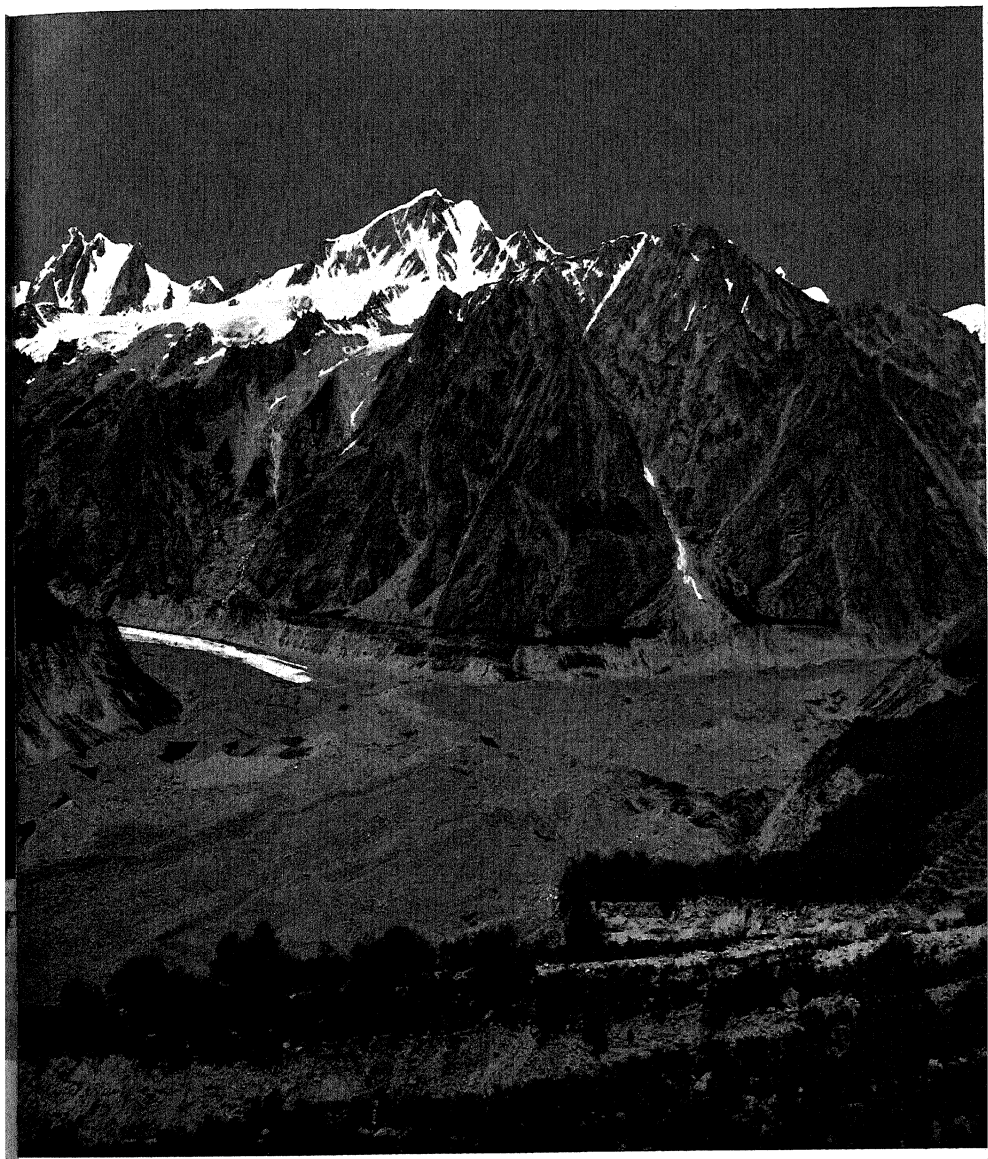
During the night the wind rose and dark clouds swept over the sky, fitfully illuminated by a pale full moon. By the next day, June 22nd, however, it had cleared up again, but the wind was still strong. Bardodej and Kabul set out for the summit, and in spite of a threatening storm and descending clouds reached a height of approximately 7000 m. at 10 in the morning. Only a few rocks showed



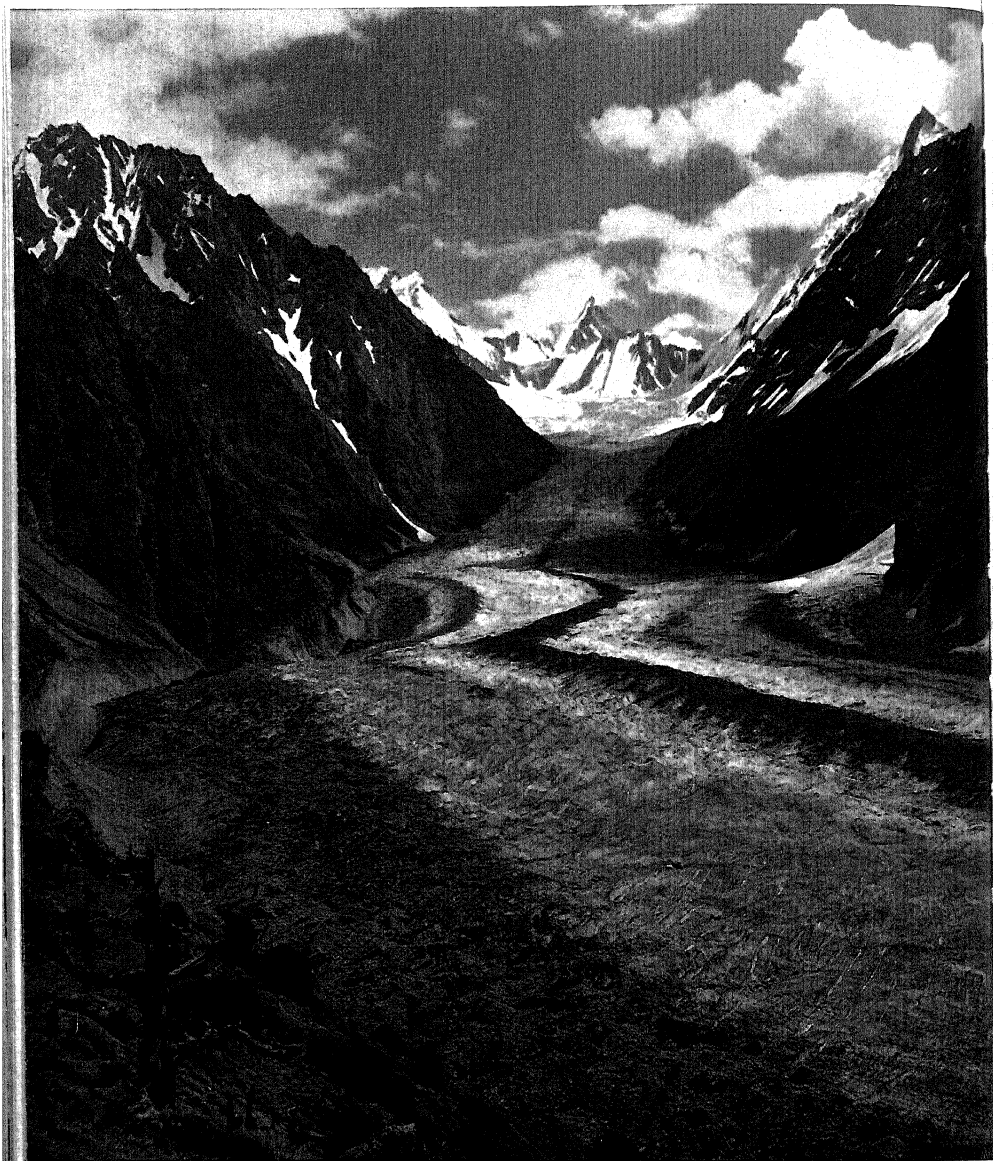
34 BASE CAMP of the German Karakoram expedition 1959 at the foot of Diran (23,900 ft.), North West Karakoram. (Photograph by German Karakoram Expedition 1959)



35 CAMP I ON THE DIRAN FACE, looking down on the icefall of the Minapin glacier. The highest summits of the main Batura range can be seen behind the lower northern chain of mountains in the middle distance. (Photograph by German Karakoram Expedition 1959)



36 LOOKING WESTWARDS from the direction of Toltar towards the junction of the Kukuvar glacier (right) and the Sat Maro glacier (left). (Photograph by German Karakoram Expedition 1959)



37 KARAMBAR GLACIER looking upwards in the direction of the dividing ridge between the upper Batura glacier and the Kampir Dior range. (Photograph by German Karakoram Expedition 1959)

through the corniced ice ridge, which was only moderately steep and not particularly difficult. But now the weather broke, and as Kabul was suffering considerable pain in his chest and throat and could hardly speak, they were forced to retreat, reaching their tent above the col about mid-day. Any further descent was out of the question and Bardodej was forced to stay a second night at Camp III with Kabul, who was now very feverish and coughing badly. It was a wild night on the mountain for everybody.

The worsening weather situation was also causing considerable unrest in the lower camps. Both porters at Camp II also had fever, so that Stocker was obliged to go down with them, in order to leave room for Klamert when he arrived. Klamert's porters had also been forced by sickness to return. He spent the stormy night alone in Camp II, terribly worried about the fate of the summit party, with whom they had been out of communication for over 30 hours.

During the night the storm increased in violence to hurricane force and even at Base Camp it was difficult to hold the tents down. The next morning it was snowing hard, and the visibility was nil. Nevertheless, Lobbichler reached Klamert at Camp II at 7 a. m. with all available porters. The day before at Camp I he had been able to observe with field-glasses Bardodej and Kabul descending to the col. They must, therefore, have reached Camp III at least. In view of this, Klamert and Lobbichler set off once again for the col, as the weather had somewhat improved.

Everybody else was assembled at Base Camp by this time, and through a break in the driving clouds were just able to perceive two tiny black dots leave the ridge and begin a slow descent. Soon after they met the climbers coming up from Camp II, and the whole group started down together.

By mid-day on the 23rd everybody was together in the great mess tent at Base Camp, tired and depressed over the second defeat, when it had seemed that victory was at hand. The doctor examined the sick porters and found that there was nothing seriously wrong with them. Somewhat embarrassed, the sun now smiled down on us, but the mountain remained enveloped in clouds. Once again Diran had struck back. May he remain the victor...

Unless we wanted to spend the entire summer attacking Diran, it was time we moved on somewhere else, for there were many other mountains and valleys in the Karakoram, which had much to offer to both climbers and scientists. Anyway at about this time, we received a warning from the Pakistan Meteorological Bureau that unusually severe monsoon weather was on the way.

Of course, as soon as we started to evacuate Camps I and II the weather

immediately cleared up as if to scorn us, but on July 2nd another hurricane burst upon us, with a violence unprecedented even for this region. It would have surely caught the climbing party on the summit ridge again, but as it was we had just got into the village of Minapin when it struck.

Intermezgo in Hunza Valley

The rain came down with such violence that within 24 hours the steep scree and rock slopes of the valley began to move downwards. Throughout the night rock falls and floods succeeded one another, to the despair of the natives, whose irrigation channels, the work of generations, were carried away in a matter of hours. Huts collapsed like paper boxes, and all roads and tracks in the Hunza Valley disappeared, cutting us off from the outside world.

When it cleared up some days later, a small party forced its way laboriously through the debris to Baltit in order to pay a visit to the Mir of Hunza, who had previously invited us to do so. On the way there we were joined by Baumert and Sahib Shah who had been busy during the last few weeks in making a cartographical survey of some glaciers situated to the south of the Batura Chain. They had just emerged from the narrow valleys of the main range when the storm burst upon them.

We reached Baltit looking rather like scarecrows, very sunburned, bearded and sweaty. We felt better after we had put on our last clean shirts and were able to do justice to the truly princely hospitality extended us.

The proverbial oriental magnificence and generosity of our host attained unexpected heights. Klamert, having quite casually expressed admiration for a wonderful carved wooden door in the town, was considerably embarrassed when the Mir had it taken down and packed up ready to take away. We took it back home and it now adorns the Bavarian State Collection, as a gift from the Mir of Hunza.

Berger, our ethnologist, had discovered that the ancient custom of the so-called "Bitan" dances was still practiced by the Hunzas and Nagaris. These genuine "trance dances" are worthy cultural and historical examples of Shamanism, which is very prevalent in Northern Asia. The Mir was kind enough to arrange for these dances to be performed for our benefit and we made a tape recording of the whole series.

Unfortunately we could not stay much longer in Baltit, time was pressing and there was still much to be accomplished among the mountains and glaciers of North-Western Karakoram.

Next we accepted with great pleasure the invitation of the Mir of Nagar and also paid him a visit. The greater part of the territory covered by the expedition lay within the boundaries of his State. He was of great assistance to us and, it is to him that we owe a large part of the success of the whole expedition.

The Residence of Nagar made a charming contrast in many respects to the more civilised atmosphere of the Court of Baltit. It gave the impression of a much more mediaeval and indigenous style. At the time of our visit, the Mir and his entire family were camping out in the gardens, for the Residence had been flooded in the recent storm.

Berger and Neureuther spent their time in extending their ethnological and anthropological work, with the friendly cooperation of both rulers. Needless to say the expedition doctor had a very large number of patients to attend to.

Lobbichler's zoological and botanical collections acquired a vast number of fresh specimens, owing to the constant variation of his field of operations, alternating between sparse and dry deserts and luxurious oases abounding in fruit and flowers. He spent many a night crouching before his tiny carbide lamp.

The Kukuvar-Baltar excursion

By July 16th the whole party had gradually assembled once again in Chalt, and now ensued a frenzied re-sorting and packing, as we were really eager to start towards the high peaks at the north-western end of the Karakoram.

In the meantime our last straggler, Willy Bogner, had turned up. He had come out direct by "Airmail" from home and at first rather upset us with his clean-shaven face and aura of sanctity and cleanliness! That, however, was soon rectified! He was accompanied by Mr. Schmidt, the First Secretary of the German Embassy at Karachi, who had come to pay us a short visit. During the whole expedition he was to us an ever-caring father. After three days he left us, the bearer of much mail and many requests.

The first party set off on the 17th with a long column of porters, led by Klamert. Up as far as Toltar many sections of road had been swept away and only slow progress was made along the hot, arid valley bottom. After three days of exhausting march, they reached the junction of the Kukuvar and Sat Maro glaciers. Base Camp was established on the high lateral moraine terrace of Kutor Dorokush (3300 m.) amid a tangled jungle of birches, junipers and willows, interspersed with meadows. This romantic spot had been picked out by Klamert in 1954 as an ideal site for a camp. From this site a comprehensive survey of the

surrounding mountains was initiated, and Rauf was at last able to resume his meteorological work.

Two more camps a half day's hike apart were erected on the upper Kukuar Glacier, to serve as advance base camps, and were equipped accordingly. Meanwhile, Bardodej and Sahib Shah with four high-altitude porters set off on the 24th for a peak of about 5900 m. situated at the western end of the area. This solitary triangular snow summit soared above Base Camp, and its isolated position gave promise of a comprehensive view of the main peaks of the chain.

On July 25th the party pitched their tents in the wide glacier trough on the south side of the mountain at about 4800 m. Next morning, Bardodej and Kabul climbed up to a gap (5300 m.) in the west ridge, reconnoitred on the previous day, and traversed over to the north arete. This latter was steep and heavily corniced but otherwise did not offer any appreciable difficulty. They reached the top at about noon in sunny and cloudless weather. The splendid view revealed all the hitherto concealed areas of this corner of the range. Further to the north, on the other side of the precipitous main chain, the steep summit pyramid of the Kampire Dior (7143 m.) stood out against the blue of the summer sky. From here it did not look easy. However, to the west of the col³ leading over from the Upper Kukuar to the Upper Batura Glacier, there was a 6000-m. peak which as far as we could observe was not likely to give much difficulty to a small climbing party. Further to the south, a snow dome of conspicuous beauty, overhanging the Sat Maro Glacier, beckoned invitingly.

However, all these mountain climber's dreams in the end remained only dreams, as things did not work out as we had hoped.

Lobbichler and Schneider arrived at Base Camp on the 29th, having come from Chalt after a diversion to the upper Daintar Valley lying to the west. There they had made a photogrammetric survey of the mountains and glaciers, as well as collecting geological and biological specimen in this previously neglected backwater of the North-Western Karakoram.

During the course of the next few days, Bardodej, Baumert and Stocker ascended again to the Upper Kukuar Glacier, while Bogner and Klamert paid a short visit to the Baltar Glacier. While they were there a runner arrived at Base Camp on August 1st with an express letter from the Political Agent at Gilgit, stating that five of the six members of the British Batura Expedition were missing on the mountain. Among them were our German friends Albert Hirsch-

³ This col was first reconnoitred by Gyr and Kappeler in 1947 (1).

bichler and Martin Günnel. We were urgently needed to assist the search party, and by a quirk of fate, now received permission to enter the Batura region, which had been previously denied to us for years!

There obviously could be no delay; every moment was of value if lives were to be saved, so all climbing activity was suspended and only the scientific work was continued.

All climbers were at once recalled to Base Camp, which was quite difficult at this particular time, as they were widely distributed throughout the length and breadth of the vast territory. Lobbichler acquainted Bardodej with the news the next day, far above Camp II, near the Batura Gap. The latter immediately started the descent and arrived at Base Camp accompanied by Stocker, while Lobbichler stayed at Camp II waiting for Baumert.

Sahib Shah went on down to Bar, where he got busy organising the necessary porters. By August 5th the rescue party (Bardodej, Klamert, Neureuther, Sahib Shah and Stocker) had assembled in Chalt. Klamert, who knew the route from 1954, was appointed leader.

In Chalt they received later information so contradictory that it appeared that such a large rescue party would not be necessary. Accordingly, Bardodej fell out and set off for the exploration of the Karambar Glacier in the Kampire Dior Range, which he had previously arranged to do with Schneider.

The party which had remained in the Kukuar area finished its scientific work there on August 7th and returned to Toltar. Schneider went down to Chalt and followed Bardodej up the Ishkuman Valley. Baumert, Berger, Lobbichler and Rauf went up the Baltar Glacier, where they remained and worked until the 18th. On the 25th they re-united in Chalt with the party from the Batura Glacier.

The rescue operation on the Batura Glacier

Klamert, Neureuther, Sahib Shah and Stocker ascended the Hunza Valley in a series of forced marches. They met John Edwards, the sole survivor of the British party in Gulmit, and received a full authentic report of the accident from him. How the accident actually occurred is still not known.

His story was as follows.¹ At the beginning of June the expedition left their Base Camp at the foot of the great icefall below the "Batura Wall", just about the site of the last camp of our 1954 expedition. Their leader, Dr. Keith Warburton, had been in the Karakoram with Gregory in 1957, on the expedition

¹ See Edward's report p. 87 et seqq.

to Distaghil Sar. The rest of the party consisted of J. Edwards, R. S. Knight, H.G. Stephenson and the two Germs, A. Hirschbichler and M. Günnel were joined in Pakistan by Jamil Sher Jan and Lieut. Qamar Zaman, the latter acting as liaison officer. The object of the expedition was to climb Batura Peak (7785 m.) by the route reconnoitred by the 1954 expedition (4).

While establishing Camp II on the top third of the 2000-m. icefall, the three Hunza porters downed tools, for various conflicting reasons, and returned to their villages. The climbing party was thus left entirely on its own, a decidedly risky undertaking when considering the difficulties of the route.

In view of this, Edwards and Sher Jan suspended their glaciological work in order to help carry provisions up to Camp III. This camp, situated in a glacier cwm above the icefall was equipped and provisioned for 28 days. This constituted a base for the summit push by the five climbers to be carried out within the next three weeks.

On June 23rd Edwards and Sher Jan left the summit party in Camp III and went down to Base Camp to get on with their work. As it turned out they were never to see their friends again.

It had originally been arranged for Edwards to report to Camp III once a week, but this plan was abandoned in order not to weaken the summit party unnecessarily and the rope ladder below Camp III was removed. Thus the last bridge was broken and each party left to its own resources.

The next few fine days gave no cause for alarm and it is known that they were still alive on the 30th. On that day a native hunter in the mountains north of the Batura Glacier observed two men through his binoculars, climbing slowly upwards with heavy sacks. According to his reliable report, they were about 1400 m. below the summit.

Two days later the hurricane broke over the North-Western Karakoram, which had caused such devastation in the Hunza Valley. The climbers must have been caught in their highest camp. Even far below, on the Batura Glacier, tents collapsed under the weight of the snow. Down in Base Camp the three remaining members of the party assumed that their friends had reached the summit and were on their way down. It was not until they were overdue and a rapid ascent to Camp III showed no signs of life that they realised that a catastrophe had happened. Thereupon Edwards started down to Pasu on the 27th and on June 28th gave the alarm.

Having returned to Base Camp, Edwards and Sher Jan once more made an attempt to get through to Camp III, but the huge icefall had so altered in

character that they were forced to turn back even before they had reached the former Camp II. They therefore struck camp and went down to Gulmit. From there Sher Jan and Lieut. Qamar had descended to Gilgit while Edwards awaited our rescue party.

After ten very strenuous days, Klamert, Neureuther, Sahib Shah and Stocker, accompanied by Edwards and our three best porters, reached the old camp site at the foot of the Batura ice wall. What Edwards had reported was only too true. The stupendous icefall had, during the last few hot weeks, been transformed into a slowly moving stream of séracs and debris, which groaned and rumbled incessantly. It was quite impossible to make a way through it, even for a very strong and large party.

Klamert and Stocker, therefore, tried to by-pass the chaos by means of a rock buttress on its orographic left side. On August 13th they climbed to the top of a 5000-m. summit overlooking the icefall and the site of Camp III above it. They searched the area for hours through their binoculars. There was nothing to be seen, no tracks, not even the sign of a tent. After a bivouac, they made a difficult ascent to an even higher summit, affording a better survey of the camp area. From here the upper summit slopes of the mountain were clearly visible. There was absolutely nothing to be seen which could give any indication of the fate of the missing party. It was only too obvious that the unusually heavy snowfall of the last few weeks and the ensuing avalanches had removed every trace. There was no point in waiting any longer and with heavy hearts they went down to Base Camp and on the 16th finally abandoned it. A few days later the whole party re-assembled in Gilgit.

Five young friends remained behind on the mountain. At the end of May, in Rawalpindi, not quite four months earlier, we had together discussed our plans for the future and now five of us had been removed by an inexorable fate. It was most uncanny how every trace of them had completely disappeared...

The Ishkuman and Karambar glacier

The region of the deep and tortuous gorges of the Hunza River system is cut off to the north-west by a huge semi-circular chain of ice-clad peaks, which form the natural western boundary of the Karakoram. On the far side of this chain, the wide valley system of the Ishkuman connects up with the Eastern Hindukush. Up to the present this isolated region had been neglected in favour of the attractions of its more celebrated neighbour. Away to the north-east rises Kampir Dior (7143 m.), the most westernly 7000-m. summit of the Karakoram

forming the western end of the Batura Chain. Here rises the Karambar Glacier which flows westwards for 20 km., flanked by 6000-m. peaks.

One of the principal objects of our expedition was to explore this western corner of the Karakoram and define its geographical and geological connection with the Hindukush.

We had originally intended to devote some time to the exploration of the Karambar Glacier, reaching it direct from the Kukuar Glacier, but the splitting of the party owing to the participation in the rescue operations had made this impossible and we had to be content with a small reconnaissance.

Imit, the Residence of the Rajah of Ishkuman, is five days march from Gilgit. As soon as one enters the territory, the contrast of the landscape with that of neighbouring Hunza is very marked. The latter comprises a tortuous gorge, flanked by rock and ice-clad walls, at the bottom of which the river rushes foaming along through a narrow canyon. Here the valley broadens out with a gravel bottom a kilometer wide. The settlements and villages are widely scattered and irrigation oases are few and far between. In fact, the Ishkuman territory was sparsely populated until 60 or 70 years ago and its "colonisation" is still going on. Hunza peasants who can no longer find space in their own country are continually infiltrating to the north. In the neighbourhood of Imit, on the other hand, the Wakhis (or Wachis), who come from the north, from the Afghanistan Hindukush, were already well installed 70 years ago.

Most of the land is not yet cultivated, and the Residence of the Rajah of Ishkuman is only slightly better than the rest of the local farms. The natural hospitality of the ruler and his people is sincere, honest and without frills. They have not attained the business aptitude of the adjacent Hunza Valley which is now reaping the benefit of the money-spending foreign expeditions and making the most of it!

By the middle of August, Bardodej and three porters had reached the tongue of the Karambar Glacier, in a two day's march from Imit. He pitched his camp at 3400 m. on the high lateral moraine. During the course of the next few days he worked his way up the difficult crevassed glacier, partly covered with debris, until he was able to get a good view of the upper névé slopes and the Kampir Dior Massif. It would appear from this that the prospects of climbing it are better from this side than from the Batura Glacier.

Schneider with two porters went back to the oasis of P'akora and turned off into a lateral valley towards the east-south-east. He intended to make a pass over the range to the lower Hunza Valley, in order to trace the geological connection



Baumert & Schneider 1960

Orographic map of Northwest Karakorum

Sketch with watersheds and glaciers (altitudes in meters), based on topographic measurements made in 1954 and 1959.
Data of the German Karakorum Expedition 1954

between the North-Western Karakoram and the Eastern Hindukush. By the middle of the second day the party had struggled up a deep and narrow gorge to reach a glacier "of Alpine standards", over which a route towards a visible col could be made. They camped on a small medial moraine on the top part of the glacier at about 4200 m. A series of ice covered peaks of approximately 5900 m. surrounds the southern rim of the glacier trough. Next morning Schneider and his party reached the top of the 4500-m. glacier pass of Naltar An, a little known and seldom used crossing over the range between the Ishkuman and the Hunza valleys. From the pass he ascended a snow summit lying to the south, which afforded a comprehensive panorama of the Karakoram and the Hindukush.

This was the last summit reached by the expedition. The same afternoon Schneider descended by the same route and reached the tongue of the Naltar Glacier. On the way back down the valley they were able to enjoy the delightful contrast of the Karakoram landscape. Thanks to its particularly favourable climate, the entire valley is richly wooded with luxurious green conifers and spruce forests. Clear water springs from every nook and cranny and far above hanging glaciers cling to the jutting cliffs. A number of emerald green lakes lie hidden in the woods.

This little paradise soon came to an end and the valley made a sudden descent into a narrow gorge, terminating at Nomal in the great Hunza Valley. Here everything was grim and bare, burned yellow by the sun, with no protection from the pitiless heat and drought of the Central Asiatic summer.

By the beginning of September the whole party had re-assembled in Gilgit. Our time was up and we had to pack and take our leave.

Once again we stood on the airfield and bade farewell to our Hunza and Nagari porters. They had become more to us than just servants and porters, we regarded them as friends who had helped us on our long journeying through the Karakoram mountains.

The results of the mountaineering reconnaissances.

Diran (7273 m.) The comprehensive report of the attempts on this peak gives all the necessary information. A summary follows here: The mountain does not offer any unusual technical difficulties, but the objective danger of the 2000-m. icefall must not be underestimated. Our mistake was in overestimating the height of the col, owing to miscalculation of the perspective from the deep trough of the Minapin Glacier. Consequently the route along the summit ridge was correspondingly underestimated. In actual fact it was at least 1200 m. high and

situated on an exposed weather divide where storms could be really dangerous. Spring or early summer would be the best time for an ascent, preferably in June. By then the winter snow avalanches have for the most part come down, and the vast hanging glacier has not yet begun its full summer activity.

The 7000-m. peaks of the Batura Range. These cannot be reached from the south. This wall of almost 4000 m. descends in one unbroken sweep of ice and rock to the névé of the glacier far below. The Shispar, Muchual and Baltar glaciers are fed almost entirely by the avalanches from it. The only comparatively weak spots of the range lie on the north side, overlooking the Batura Glacier (2, 4). The tragic fate of the last Batura expedition clearly shows that an ascent over this heavily crevassed face is not to be undertaken with impunity. The difference in height between Base Camp and Batura Peak (7785 m.) is over 4000 m., which is greater than on Everest!

The Kukuar and Sat Maro glaciers. Here there are a number of peaks of almost alpine character. As they are all below the 7000-m. mark, they could be tackled by smaller expeditions. Even so, the long route up over the crevassed glacier should not be under-rated. P. 6293, situated at the south-western edge of the Sat Maro Glacier, is a fine ice peak with gentle slopes, and P. 6872, just to the west of the Batura Gap (1) above the upper Kukuar Glacier, should be accessible over their south-western or south-eastern ridges without much difficulty.

Kampir Dior (7143 m.) This peak lies at the extreme western end of the main chain, far removed from previous expedition routes and is not easily accessible. The best way would appear to be via the Karambar Glacier. It is definitely inaccessible from the Kukuar Glacier. Based on his observations, Bar-dodej reports as follows: "Both west and south ridges are long and exposed to avalanches in bad weather. Of the two, the south arete appears to me to be technically easier and safer. It has, however, two doubtful passages, one on the lower part is a steep snow slope about 100 m. high, possibly exposed to avalanches, and the other is a gendarme situated on the ridge higher up. Above this is a shoulder from which an easy snow arete leads up to the summit."

Scientific activities

As the principal object of the expedition was scientific, a short summary of the results is appended herewith. Before the final results can be published, the material and information collected must be thoroughly evaluated.

The most important object of the expedition was the completion of the map surveys begun in 1954. The Karakoram range is the largest glaciated mountain area in the world, outside the Arctic circle. The surface actually covered by ice is on an average 28% of the entire chain, rising to 50% in some regions, compared with corresponding figures of 2.2% in the Alps and 8-12% in the Himalayas. Thus, the cartographical survey is not only of geographical but of special glaciological interest and may be of value in connection with the results of the International Geophysical Year. It will also provide a reliable map for future mountaineering expeditions.

Hans Baumert was in charge of the geodetic and photogrammetric work and during the course of the expeditions covered over 40,000 vertical meters with his photo-theodolite. More work was also done in certain outlying regions by H.-J. Schneider with a second instrument. Photogrammetric measurements of the rate of flow of several large glaciers were also undertaken by them.

Sahib Shah, who had accompanied many previous Karakoram expeditions, continued his routine plane-table surveys for the Survey of Pakistan. This time he had been assigned to our expedition with the rather thankless job of "government business", because he was surveyor and liaison officer combined.

Mr. S. A. Rauf, of the Meteorological Department of Pakistan, was our meteorologist, also a somewhat thankless task. He carried out many photoelectrical measurements of the intensity of the sun's rays on a number of glaciers, which were of considerable importance for glaciological questions. Baumert gave him some training in the methods of the photogrammetric survey of glaciers, which was considered of special importance by his department.

Schneider principally devoted his time to the completion of the geological work which he began in 1954 (5). During the course of his studies in the Ishkuman region, he was able to make important observations concerning the geological connection between the Karakoram and the Hindukush. From a structural point of view, this mighty chain can be considered as a "twin brother" in the same age group as the Alps and the Himalayas. Schneider continued the terrestrial magnetic measurements begun in 1954 and carried out a number of observations with an Askania variometer Gf 6. The 1954 stations were used again and measurements extended to the west and north-west. The recording station which the Meteorological Department of Pakistan plans to set up in Gilgit is already regarded as a "base" for the station network of North-Western Karakoram.

The inhabitants of the North-Western Karakoram, the Hunzas and Nagaris,

have attained a certain celebrity during the last few years through certain more or less accurate reports. There is no doubt, however, that in the ethnological sense they form a foreign element within the confines of the Central Asiatic peoples. Their principal language, Burushaski, has no connection whatsoever with the language of the neighbouring peoples. Their origin lies far back in the history of the world, and the main object of our anthropological and ethnographical research was to unveil this secret.

The expedition doctor, Gottfried Neureuther, carried out hundreds of anthropological tests on the natives and took a number of blood tests as a basis for a new type of diagnostic treatment. In addition to this he also worked on a number of physiological problems, particularly in the higher camps. For this purpose he used the climbers as guinea-pigs and extracted samples of their blood on several occasions. Several samples of serum arrived quite successfully by air in Germany.

Hermann Berger, our ethnologist, made a number of tape recordings of the speech, music and folklore of the Hunzas and Nagaris, comprising legends, fables, folk songs and instrumental pieces, in the Burushaski and Shina tongues. The cultural-historical importance of the mysterious primitive "Bitan" dances have already been mentioned. Thanks to his unusual knowledge of languages, Berger came into much more intimate contact with the local population than is usually the case with expeditions of this nature. Much which was unintelligible to us in 1954 suddenly made sense and their customs and ceremonies gradually became familiar.

The region between the Karakoram and the Hindukush was also of great interest to us botanically, for it is here that the last transitional steps take place between the sub-tropical flora of the North-Western Karakoram and the arid zones of Central Asia. The botanical research carried out by Paffen in 1954 (2) were now completed by Lobbichler's fresh specimens. He brought back with him more than 700 different types of plants, collected in the desert steppes of the valleys, the sparse woodlands higher up and the mountain pastures at the edge of the snowline. Lobbichler also made a large collection of insects and also had some success in fishing in the dirty turbid waters of the rivers. But he did not hand over the small and beautiful fish, in spite of the grumbling of his friends. Like all conscientious scientists he had to force himself to renounce this momentary burst of glory. And like the fish, only in the future will all the other scientific results of the expedition come into use.

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LAST OF THE FORERUNNERS TO DHAULAGIRI

AUSTRIAN DHAULAGIRI EXPEDITION 1959

By Fritz Moravec

When Nepal opened her frontiers in 1950 the way to Dhaulagiri became, for the first time, accessible to mountaineers of the outside world. Six expeditions tried to conquer the white giant during the eight years that followed and all of them—French, Swiss, Argentinians and Germans—were defeated by Dhaulagiri which defied them with its dreaded arsenal of avalanches of stones and snow, ice and raging storms.

It was during the pre-monsoon period of 1959 when, for the first time, an Austrian expedition made an attempt on this 8000-metre peak.

It was planned and carried out by the Austrian Himalayan Society in Vienna and led by the engineering scientist Fritz Moravec who had taken part in the reconnaissance to Saipal in 1954 and led the successful expedition to Gasherbrum II in 1956. The remaining members, all experienced mountaineers, were: Dr. Wilfried Wehrle, surgeon (27), Othmar Kucera (27), Stefan Pauer as photographer (36), Karl Prein (31), Heinrich Roiss, deputy leader of the expedition (32), and Erich Vanis (31).

Mountaineers do not acknowledge national frontiers. They form one team which Dr. Tonella aptly called an "international rope" united by their love of the mountains. Evidence of the fact that mountaineers of all nations belong to one and the same community was forthcoming in a manner which left nothing to doubt when I began preparations for the 1959 expedition, reports and experiences of all previous expeditions being made available to us unstintingly and willingly. My fellow countryman Herbert Tichy undertook to establish contact between Sirdar Pasang Dawa Lama and myself, since it was our intention to avail ourselves of his services as Sirdar of the Sherpas. Even Gerhard Watzl, domiciled in Argentina, submitted a number of valuable suggestions. Then there was my personal talk with Otto Barreiss of Stuttgart who managed to convey such a graphic picture of the treacherous north face of Dhaulagiri that it almost became a nightmare for some time afterwards. A last-minute hitch in

connection with the oxygen apparatus was speedily overcome thanks to the efficient intervention of the Swiss Foundation for Alpine Research. Letters from Max Eiselin and Detlef Hecker (members of the 1958 Swiss Dhaulagiri expedition) reached us when we were already at the Base Camp. They strongly urged us to examine carefully the possibilities of the north-east arête, both being convinced that this route was more favorable than the traditional one through the north face, the so-called Pear Route.

The spot where the Base Camp was to be erected was reached on April 3rd along the approach route discovered by the Swiss expedition of 1953 and our tents were set up on the Mayangdi Glacier, on the northern side of Dhaulagiri, at an altitude of about 14,700 ft. The journey from Pokhara had taken us sixteen days, the usual delays having been caused by occasional sit-down strikes by the porters.

Six days after our arrival at the Base Camp, Erich Vanis, Pasang Dawa Lama and I set out on a reconnaissance of the north-east arête, accompanied by four Sherpas. Although I had made up my mind to try the north face, I nevertheless wanted to study the north-east arête of Dhaulagiri from close range, as Eiselin and Hecker had suggested. The first third of our ascent followed a route overshadowed by an enormous precipice which we baptized "Eiger Face" in view of its similarity with its famous counterpart in the Bernese Oberland.

As a result of the intense glare of the sun, the snow was turning into a quagmire in which we were floundering. None of us was used to the altitude and consequently everybody was suffering from lack of oxygen before we had even passed the 16,000-ft. mark; we therefore decided to erect a camp in the middle of an icefall during the afternoon, at an altitude of 17,200 ft.

On the following morning, we continued our ascent over glaciers covered by deep snow, first in the direction of the north-east Col and then towards the Tukucha Peak. At 11 a.m. layers of clouds began to hide the summit of Dhaulagiri from our view and consequently a decision had to be reached at 18,300 ft. on the route which we were going to take.

It did not take us long to realize that every fall of new snow would multiply the objective danger inherent in the "Pear Route". Conversely, there would be less danger of stone avalanches along the arête and since the route along the north-east arête would be largely an ice climb, we would be able to prepare a suitable path for the high-level carrying parties even under less favourable weather conditions. We also felt that there would be no technical difficulties along the arête, once the 23,600-ft. mark was passed, whereas they tended to

increase on the north face route towards the summit ridge. The north-east arête then, it was to be.

In deciding on this route we were supported by Pasang Dawa Lama who on two occasions had reached a very high altitude along the "Pear Route" and maintained that three weeks would be saved by taking the route along the north-east ridge.

The temporary camp where we had sheltered was extended and subsequently became High Camp I and what had originally been intended as a reconnaissance became, in fact, the first stage of the assault on the summit. Day after day, climbers and porters could be seen ferrying loads and on April 15th Camp II was built at 18,700 ft., just below the north-east Col. Another six days later we were able to move into Camp III, which stood at an altitude of 20,000 ft., and on April 24th the message was broadcast that the first tent had been erected at 21,300 ft. at the foot of the steep rise in the north-east arête.

So far, so good. Three High Camps had been erected within two weeks and a fourth was well on the way to completion. We felt there were reasonable grounds for cautious optimism.

However, the first serious setback came on April 29th, like a flash of lightning out of an untroubled sky: Not far from Camp II our friend Heinrich Roiss had fallen into a deep crevasse which narrowed towards its bottom. Despite an all-out rescue operation which was immediately started by all members of the team, who spared no effort to save his life, Heinrich Roiss was already dead when they found him. He was buried in the shadow of Dhaulagiri.

For us, the struggle for the "White Mountain" had to go on, as our friend Roiss, we thought, would have wanted it.

There were more trials to come. The tents of Camp III were found buried under fresh snow, their walls torn to shreds, their supports broken like match-wood. Obviously, there was only one solution: to dig caves in the ice.

High Camp IV resembled an eagle's eyrie. When Pasang Dawa Lama and Sherpa Pasang spent their first night up there, the vicious gale tore their tent to pieces, leaving them exposed to its fury all through the night. They had to hang on until the first light of the new day enabled them to start digging a cave in the ice, as all the others had done.

The task of preparing a safe passage through the steep icefall above Camp IV was impeded by the infamous "Dhaulagiri weather"—snow plus gales—which fully lived up to its sinister reputation; moreover, pitches of sheer ice were becoming increasingly frequent.



38 top: SUMMIT OF DHAULAGIRI (26,976 ft.) from the north. North east spur on the left, "Eiger" on the right.
 bottom: DHAULAGIRI from the north, showing the enormous rock face, called "Eiger" by the Austrian expedition, due to the similarity to the Eiger north face. (Photographs by Austrian Himalayan Association)



39 VIEW FROM THE SUMMIT OF DHAULAGIRI (26,976 ft.) looking north-west towards Dhaul Himal and Tibet. (Photographs by Swiss Himalaya Expedition 1960)

The first rope was fixed on May 7th but another two full weeks were to pass before this section (a difference in altitude of about 2000 ft.) could be considered sufficiently safe for the "ferries".

During the night of May 19, a second major disaster was narrowly avoided. Hans Ratay and three Sherpas were asleep in Ice Cave IV when Ratay awoke, gasping for breath, an avalanche having covered the entrance to the cave. It took the four men many hours to dig themselves out. Luckily, there was a tiny crevasse running through the cave through which fresh air had been allowed to penetrate, thus saving their lives.

Obviously, our position had become very dangerous indeed. The time scheduled for the assault on the summit was already exceeded and the monsoon could be expected to set in almost any day. In addition, our stores of petrol and food were gradually becoming depleted. A snap decision was inevitable: all sahibs and Sherpas suffering from exhaustion or illness were to descend to the Base Camp without delay. Those who were still feeling sufficiently fit and energetic would immediately set out for the summit. It was our last chance.

Ratay, although still slightly benumbed by his terrifying experience, managed to pull himself together and to be the first to reach the small platform at an altitude of 23,000 ft. which we had in mind for High Camp V. At long last, after many unsuccessful attempts, the way to Camp V was open and the summit within reach. An invisible barrier had been overcome. On May 22nd Pasang Dawa Lama erected the tents of Camp V and prepared the severe pitch above the camp with pitons and fixed ropes. On May 24th, Pasang Dawa Lama, Sherpa Pasang, Gyaltzen and Karl Prein who had joined us in the meantime, continued their ascent up the ridge and finally managed to pitch a tent at 24,200 ft. That tiny place of shelter became Camp VI, starting point for the final assault. The morning of May 25th dawned bright and clear, but when Karl Prein and Pasang Dawa Lama stepped outside the tent they walked into a raging gale which seemed to surpass anything human beings could endure.

Yet they went on grimly, for four solid hours, along the ridge which no longer offered any technical difficulties, but they nevertheless felt that they were reaching the limits of their endurance. At about 26,000 ft. fingers and toes became completely numbed. The way ahead seemed quite straightforward; another five or six hours, and the summit would have been theirs, had it not been for the terrible gale which kept clawing at them with inhuman fury, until they could no longer place one tired foot in front of the other. They had to turn back, only to find their tent damaged. The night that followed was long and bitterly cold.

However, they were not beaten yet and on the following morning they once again set out for the summit. The weather had deteriorated, the sky had become overcast, clouds were gathering and the gale, too, had become even more violent. All-India Radio reported gale-force winds up to 100 miles an hour at 23,000 ft. Despite their indomitable courage the two climbers did not even manage to reach the spot where they had to turn back on the previous day. Once again, the gale forced them to retreat to their precarious shelter where, to their surprise, they were met by the two Sherpas who had descended to Camp V the day before. However, Camp V was no more—the tent was buried under a stone avalanche and thus they, too, had come to seek shelter in Camp VI. The four men spent the third night at 24,000 ft., huddled together in one tiny tent; no wonder that even Pasang Dawa Lama, normally given to understatement, called it one of the worst nights of his life.

The grim conditions steadily became even worse. With incredible energy, Prein and Pasang Dawa Lama launched yet another attack only to be beaten back quite soon by a howling blizzard. The game was up. They realized that the monsoon had set in and put an end to any attempt on the summit. There was only one sensible alternative—to retreat to the lower camps.

Othmar Kucera and I had waited in Camp IV as support group for the summit team. If the others had not returned by May 27th we should have gone up to give whatever help was needed. However, all four arrived just before noon, utterly exhausted and suffering from exposure, but otherwise unharmed.

It had not been easy for Karl Prein and Pasang Dawa Lama to resign themselves to their fate. At the spot where they had to turn back, Pasang shook Prein's hand and remarked sadly: "We just haven't got the key to this mountain. For the third time now I am so near to the summit, but the gods do not want me to enter their dwelling place."

One year later, on May 13, 1960, six radiantly happy mountaineers stood on the summit of Dhaulagiri which they had reached after a long and bitter struggle. Max Eiselin, leader of the successful expedition, sent me a letter in which he said: "The fixed ropes which you had fitted were of considerable use to us, particularly between Camps IV and V (our Camps V and VI) and have saved us much valuable time. Please accept our sincere thanks for your preparatory work which has contributed to our success."

We, too, could derive a certain measure of satisfaction from the fact that our expedition had been able to make a contribution towards the first ascent of Dhaulagiri.

THE ASCENT OF DHAULAGIRI

REPORT ON THE SWISS HIMALAYAN EXPEDITION 1960

By Max Eiselin and Ernst Forrer

"Ramro Sherpa Tensing le—gane Himal tsutsura" seemed to be the favourite tune of our Sherpas—at least they had been singing it all day long. Apparently the potent "rakshi" served by the Head Lama of Tukucha had gone to their heads. So far as we were concerned, however, it would be exaggerating somewhat to say that we felt like singing; anything but, in fact. Silently we kept gazing up to the Himal, the "Snowy Mountains", with Nilgiri, the "Blue Mountain" on one side and Dhaulagiri, the "White Mountain", on the other. The narrow, wild valley of Tukucha, through which runs the foaming Kali Gandaki (also known as Krishna Gandaki), is a mountaineer's paradise, beautiful beyond description. Not very surprisingly, therefore, several expeditions which had set their sights on the eighthousanders in the vicinity, had established their headquarters within the walls of Tukucha. Thus, the successful assault of Annapurna in 1950 had started from here, heralding a new era in Himalayan mountaineering: for the first time men had set foot on the summit of an eighthouser.

Year after year, climbers from all over the world came to remote Tukucha. Annapurna was first among the 8000 m. giants and as years went by, Tukucha's second guardian, Dhaulagiri (8172 m.), also became famous as the last of the fourteen giants still resisting all attempts to conquer it.

Climbers from France, Argentina, Germany and Switzerland had loitered in the narrow streets of Tukucha, beaten and disappointed by their failures. We, too, had returned here in summer 1958, defeated by the mountain. However, George Hajdukiewicz and I had made up our minds to have another go at Dhaulagiri. Our careful preparations for the assault, which had taken years, must not have been in vain. One thing was certain: a better route had to be found. We would give the north-west face a wide berth.

Bad news was waiting for us at Kathmandu: the Government of Nepal had refused permission for our expedition to Dhaulagiri in the following year (1959), a strong Austrian team under the leadership of the Himalayan veteran Fritz Moravec, a Viennese engineer, having secured approval for an assault on Dhaulagiri.

lagiri in that year. Mountaineering interest had become centred on Dhaulagiri, highest unconquered summit in the world, and ten applications for expeditions in 1960 had even then been submitted to the Nepalese Ministry of Foreign Affairs. I flew back to Switzerland at the end of June 1958, and the outlook seemed very bleak indeed. However, things began to look up again when the long hoped-for permit arrived from Nepal in December; and in summer 1959 the world received the news that the Austrians, too, had been defeated, despite the fact that they had chosen the route along the north-east ridge which I had recommended.

March 1960 arrived at last and we were back in Nepal, thirteen members of the expedition, plus six Sherpas and the liaison officer. It was intended to be a purely mountaineering expedition, without any scientific background, and I had organised it as a private venture without any Government support. With us we also had a number of foreign mountaineers, some of dual nationality—both of Switzerland and their country of residence—and, as a novelty in the history of Himalayan mountaineering, an aircraft equipped for glacier operations, with two pilots. Our team consisted of the following members: Hugo Weber, Albin Schelbert, Michel Vaucher, Peter Diener, Ernst Forrer, Dr. George Hajdukiewicz, Adam Skoczylas, Kurt Diemberger, Norman Dyhrenfurth, Jean-Jacques Roussi, Max Eiselin and the two pilots, Ernst Saxer and Emil Wick. The majority were under thirty, and most of the Sherpas, too, were quite young men, without any expedition experience, from the Solo Khumbu. I had deliberately not engaged any of the well-known Sherpas in view of the fact that it had been precisely the young, unspoilt men from the Solo Khumbu who had given me the greatest satisfaction in 1958. The recruitment of Sherpas had been entrusted to Jean-Jacques Roussi, who had already spent two years at Kathmandu in the service of the Swiss Foreign Aid Organisation. He selected the following team: Ang Dawa from Khumjung, as Sirdar, Ang Dawa from Khumde, Nyima Tensing, Nima Dorje, Nawang Dorje and Urkien II. There was only one Sherpa from Darjeeling, Ang Dawa, Dyhrenfurth's assistant camera-operator. Min Bahadur Sherchan, a tough Gurkha from Datopani, was detailed by the Nepalese Government to join us as liaison officer.

We reached Nepal within one week on board our single-engined "Pilatus Porter" aircraft which we had baptised "Yeti". The Government had given us permission to fly wherever we liked and we were looking forward, although not entirely without apprehension, to our first glacier landing. We knew that Hermann Geiger had succeeded in landing his aircraft at over 4200 m. in the Valais Alps, but our "Dhaulagiri airport" was situated at an altitude of about 5700 m. and

it was impossible to predict the behaviour of the powerful engine of our aircraft at that height. The first flights were carried out with a load much lighter than the permitted maximum and we were greatly relieved to find that the "Yeti" became airborne after an amazingly short take-off, despite the shortage of oxygen in the atmosphere.

The main task of the aircraft was to be the transport of equipment in order to avoid the approach march through the long, steaming valleys of Nepal and the reconnaissance of our proposed route from the air. We also thought that photographic surveys of other areas in the Himalayas might become feasible.

There were many who considered the use of an aircraft for expeditionary purposes in the Himalayas downright revolutionary. Eyebrows were raised and heads were shaken at this almost sacrilegious departure from the traditional column of porters, winding its weary way through the valleys and gorges of Nepal; and understandably enough, there was no shortage of well-meant advice.

Our equipment and provisions weighed about six tons. Transport by conventional means from Pokhara (900 m.) to our Base Camp on the North-East Col (5700 m.) would have taken 200 porters over twenty days, covering a distance corresponding to that from Zürich to Chiasso. The coolies, however, would not last beyond 4700 m., which would have meant a time-wasting shuttle service to the North-East Col of Dhaulagiri.

With the aircraft, however, we expected stores and the team to reach the Dhaulagiri North-East Col within ten days, even when working to a most conservative schedule. Apart from saving ten days, the camp would, as we thought, become a really well-equipped base whereas, if we had to proceed under our own steam, it would already be a high camp or an "advanced base".

We did not deem it advisable to carry the team, without any transition, from 900 m. straight up to an altitude of over 5700 m. and therefore planned an "acclimatisation base" somewhere in the region of 4000 m. After one week at that base, including a few suitable practice climbs at the 6000-m. level, we hoped to become accustomed to the altitude and the shortage of oxygen.

After numerous reconnaissance flights we had managed to find only one convenient location for such an acclimatisation base, the Dambush Pass, although its altitude of about 5200 m. was far beyond the level considered ideal for our purpose. Unfortunately, there was no alternative, but we realized that we would be able to descend from there in the direction of Tukucha to any level we desired, if need be down to 3000 m. or even lower.

Our two pilots, Ernst Saxer and Emil Wick, then started their daily shuttle

service between Pokhara and the Dambush Pass, carrying one case after another of our voluminous luggage, and even mail was delivered by our faithful "Yeti" — an unheard-of luxury by Himalayan standards, considering that mail-runners would have needed weeks of laborious foot-slogging.

However, there were limits to flying, since the unreliable weather left only sufficient margin for two flights a day. Fine weather early in the morning nearly always meant conditions deteriorating towards 10 or 11 a.m. Then the first thermal clouds would appear and gradually the sky would become overcast, snow would begin to fall on the heights and not infrequently a storm would break loose. For us that would mean a hasty retreat into our warm sleeping bags, unless we happened to be on the way back from a practice climb.

The effects of the abrupt change to 5200 m. were brought home to us very forcibly indeed during the first three or four days on the Dambush Pass. Two hours after landing the sudden shortage of oxygen already began to make itself felt in the form of loss of appetite and insomnia. Our Himalaya "veterans" were in considerably better shape, conclusive evidence of the fact that acclimatisation to extreme altitudes, once acquired, lasts for years. It was most important for each of us to spend the first few days in a prone position in order to avoid over-exertion of any kind; and indeed, despite the abrupt transition from 900 m. to 5200 m. and the equally sudden change from tropical heat to arctic conditions, the experiment proved successful. Most of our team became acclimatised after no more than four days and were able to undertake practice climbs on the 6000-m. peaks in the vicinity. I was personally surprised to note that I experienced less difficulty than two years ago when I had to climb this enormous step on foot. Roussi, with his long experience in the Himalayas, felt perfectly at ease and George and Norman also soon recovered from the initial adverse effects of altitude. Adam Skoczylas was the only who did not appear to be sufficiently fit and after a few days he had to be flown back to Pokhara. Two of the Sherpas and one of the team caught colds which, however, was nothing unusual.

The first few members of our team had safely landed on the North-East Col when the unexpected happened: our aircraft, which had rendered us such invaluable services, did not turn up. We waited a few days, but in vain, and when a week had passed we decided to carry on on foot. Approximately one quarter of our stores were still partly on the Dambush Pass and partly down at Pokhara; the major part of our equipment and provisions had already reached the North-East Col of Dhaulagiri. Even so, a serious problem was created: the expedition did not include one single porter and of the seven Sherpas only three were

on the Dambush Pass! Obviously, there was only one thing to do—knuckle down to the job of lugging a number of particularly hefty rucksacks across Frenchmen's Pass into the valley of the Mayangdi Khola and from there up the heavily-crevassed Mayangdi Glacier to the North-East Col. There would have been no load-carrying at all, had everything gone according to our plans, but as it was we had to carry not only loads, but loads which by far exceeded the usual limits.

The first depot was at last installed on Frenchmen's Pass (about 5280 m.). There was first a 600-foot descent from the Dambush Pass down to the Unknown Valley and, after ascending its gentle incline, the bleak col was reached from which European mountaineers gazed upon the enormous northern wall of Dhaulagiri for the first time in 1950.

Stores and equipment were piling up on Frenchmen's Pass, carried up pound by pound from the acclimatisation base. Although we did not exactly consider load-ferrying one of the highlights of Himalayan mountaineering we still preferred it to lying about in our tents, waiting for the "Yeti" whose fate was beginning to prey on our minds.

On the evening of April 21, however, when we were celebrating Roussi's 31st birthday, there was an end to our worries and anxieties about the fate of the aircraft and, in particular, that of the two pilots. I had just stepped outside the tent when I caught a glimpse of a few figures in the fog below the Col and heading for our camp. We soon recognised our friends Ernst Saxer and Norman Dyhrenfurth, as well as the Sherpa cook Ang Dawa and the Pokhara coolie Sun Bahadur who had accompanied them on a forced march through the Kali Gandaki Valley. This incident taught us to appreciate the advantages of our friend Ernst Saxer being not only a pilot, but a mountaineer as well; otherwise he would hardly have been able to cover on foot the distance from Pokhara to the Col, which he had been used to flying, in order to tell us the news of the dramatic crash-landing of the "Yeti".

It all happened on April 13. Shortly after take-off from Pokhara airfield a detonation shook the aircraft and engine parts were seen flying in all directions. One of the cylinder-heads in the powerful engine had cracked. The forward view from the cockpit was completely blocked by the dark-coloured sticky oil which settled on the wind-screen and direction-finding became possible only through the side windows. The emergency landing on Pokhara airfield was nevertheless carried out successfully and Emil Wick, our mechanic and co-pilot, had to face the fact that the engine was damaged beyond repair. There was no alternative

but to send a telegram to the Pilatus Aircraft Works requesting the despatch of a spare engine, and to await its arrival.

It was particularly unfortunate that this accident should have occurred so soon, exactly one month after our departure from Zürich. The acclimatisation camp had not yet been moved from the Dambush Pass to the North-East Col, nor did it look like being moved there for quite some time to come. Indeed, many stores were still at Pokhara and had to be carried through the jungle gorge of Mayangdi Khola to the Base Camp by our friends Skoczylas and the liaison officer Min Bahadur Sherchan, assisted by a gang of coolies. The accident had split our expedition into five small groups, completely isolated from each other—a serious setback on an eightthousander where only a highly efficient and well-organised team could hope to succeed.

I went back to Pokhara with Ernst Saxer in order to deal with the administrative problems of importing the aircraft engine and in the meantime the load-ferrying from the Dambush Pass to the North-East Col was to continue. It was decided that a group consisting of the fastest climbers should try to establish liaison with the most advanced group on the North-East Col and to prepare the ascent across the desolate Mayangdi Glacier. George Hajdukiewicz was to bring up the rear. His task was the organisation of the load-ferrying and his group was expected to join Adam Skoczylas and Min Bahadur Sherchan on the Mayangdi Glacier. Peter Diener's group was then to descend from the North-East Col and thus, by uniting all our forces, a shuttle service would be started.

In the meantime, the leading group, consisting of Forrer, Diemberger, Schelbert and three Sherpas, intended to push on from the North-East Col in the direction of the summit. Their main task was the building of the high camps, but they would, of course, attempt the summit, if at all possible. The main expedition, including thirteen climbers, had thus become a small assault group, in view of the fact that only three climbers and an equal number of Sherpas were, at the time, engaged in actual mountaineering.

However, fate had a few more surprises in store for us, and not pleasant ones either. The leading group discovered that there was no oxygen, since only the heavy cylinders, intended for use by the pilots, were functioning. The super-lightweight ones, charged under higher pressure, were practically empty. So that was that—no oxygen on Dhaulagiri.

The result of this tough physical activity was a very efficient acclimatisation. Ernst Forrer, a postman from Wildhaus, showed distinct symptoms of becoming a physiological freak—whereas Himalayan climbers normally tend to lose weight,

as a result of lack of oxygen, loss of appetite and insomnia, our friend was actually gaining! He ate as much as he used to do at home, did not suffer from insomnia, and his general condition was even better than that of the Sherpas used to these altitudes. He was willing to make a track through fresh snow all day long without ever taking a breather and if one of the team happened to get tired of carrying his load, Ernst Forrer would simply carry for two. And all this above the 7000-m. level.

The leading group pressed on until a suitable spot for the next camp was found at about 6600 m., beneath a huge overhanging ice wall which completely protected the two-men tents from ice avalanches. It was an exposed, though perfectly safe "eagle's nest". Unfortunately, heavy storms, depositing huge masses of fresh snow day after day, prevented any further progress for almost two weeks. This camp was already situated on the famous "ice face", the key to the north-east spur of Dhaulagiri. At last, however, the steep ice face itself was conquered and the two Camps IV (7050 m.) and V (7450 m.) erected on the steeply inclined and exposed north-east spur. Hardly three weeks had passed since the unfortunate emergency landing of the "Yeti" when the three made their first attempt on the summit.

The weather was fine when they set out from Camp V but a wrong route which they took meant precious time wasted and by noon they had gained barely 350 m. Then the weather broke. Under the vicious onslaught of a howling "Dhaulagiri gale" there was no longer any question of further advance. Instead, every ounce of effort had to be devoted to the task of regaining the shelter of Camp V. This setback was additional proof of the fact that any attempt on the summit after noon was doomed to failure. However, in order to enable the party to return from the summit by mid day, the final camp would have to be erected at an altitude of at least 7800 m. and consequently there had to be a Camp VI.

Meanwhile, the "Yeti" had been fitted with a new engine, which had been flown to Pokhara by Hans Reiser, an engineer of the Pilatus Aircraft Works, in a specially chartered aircraft. On May 5th the "Yeti" once again landed on the North-East Col where the advance group also returned on the same evening. We were all happy to meet again our friends who had almost reached the summit. A few days later we were joined by the "supply group" and thus, at long last, the whole expeditionary force was together again. By and large, the consequences of the accident on April 13th could have been much worse and we were at least quite happy about the efficient operation of each of the separate groups. If any one of them had not pulled their weight, delays of a most serious nature could have been caused.

However, there was fresh cause for alarm because, once again, our aircraft was missing. For a few days we just refused to believe that another mishap could have occurred but as we watched relays of Indian Air Force jets circling over Dhaulagiri we realised that something must have gone wrong. Listening in to All-India Radio we learned that the fate of our "Yeti" had indeed become the talk of the world at large. Assuming that an accident had happened either when taking off or landing on the Dambush Pass, I detailed Ang Dawa, Sirdar of the Sherpas, to proceed there, accompanied by the liaison officer with a wireless set, complete with freshly-charged batteries. Our fears were confirmed all too soon: according to the wireless message, the "Yeti" had indeed crashed there and was completely destroyed. Fortunately, the two pilots had escaped unharmed. A few days later, Ang Dawa brought a letter which Ernst Saxer had left behind in the deserted camp on the Dambush Pass, telling us that on May 5th, i.e. two days after re-commissioning, the "Yeti" had crashed, shortly after take-off, from an altitude of about 40 m.; it appeared that the rubber sleeve on the steering column had become detached, causing the pilot momentarily to lose control of the aircraft. It had to be written off, since there was no longer any question of repairs. Saxer made an attempt to re-join the assault team but, as a result of the physical strain during the preceding days, he had to give up even before reaching Frenchmen's Pass and had to muster all his remaining strength in order to regain the Dambush Pass. There was nothing the two pilots could do except wander back to Pokhara and return home; without their aircraft they had become redundant.

Meanwhile, we had not been wasting our time. A few days later, another assault was launched on the summit, Forrer, Diemberger and Schelbert setting out accompanied by the two strongest Sherpas, whereas Diener, Weber, Vaucher and Roussi had already reached the high level camps.

Finally,¹ the day had come when I took leave, together with Schelbert, Diemberger and the two Sherpas Nyima Dorje and Nawang Dorje, of my friends who remained behind in the Main Camp. Three days later, in the newly erected Camp VI at an altitude of 7800 m., we awoke to a bright, sunny morning. It was on this spot that ten days ago we were caught in the mid day storm, just below the snow-covered fore-peak of Dhaulagiri, and had to beat a hasty retreat. Now my faithful companion Peter Diener was also with us and thus there were six of us, having to share a tent designed to hold two. The accommodation was not unduly comfortable, to put it mildly, and at last Nyima Dorje got fed up with it,

¹ The following lines were written by Ernst Forrer.

grabbed his sleeping bag and simply camped out—at a temperature of -30° Centigrade!

At 8 a.m. he and I roped up together, closely followed by the second rope, consisting of Kurt Diemberger with the Sherpa Nawang Dorje and Peter Diener with Albin Schelbert on the third. Belaying had to be done with special care, treacherous fresh snow coating the rock faces and making climbing even more difficult. I did not think that the degree of difficulty was more than moderately severe, if not less—just about intermediate stuff at home. However, at 8000 m., and without oxygen, the problem was entirely different—lungs aching, gasping for breath after each step, calling upon the exhausted body to muster its last reserves. According to the mutterings of Diemberger, all this effort would have enabled us to climb Broad Peak not just once, but at least twice. But Dhaulagiri had to be measured with a different yardstick altogether and we had to consider ourselves very lucky indeed to be blessed with a calm morning.

After a few steep sections the difficulties seemed to be over, as the ridge became almost level; but it remained a knife edge, reminding me of the Biancograt on Piz Bernina. Far ahead, not much higher, but still a long way ahead, appeared what looked like the summit. Below, on the right, were the rocky bluffs of the north-west ridge, through which led the Pear Route, where six expeditions which had preceded us were forced to turn back. Even the north-east ridge on which we were now was virgin ground. Nobody had preceded us here.

Shortly after noon, all six of us were standing on the summit of Dhaulagiri. Never before had so many climbers reached the top of an 8000-m. peak at the same time. And for the second time—after Lhotse—the flag of Switzerland was raised on the summit of a giant mountain whose summit snows we were the first to tread.

To the south, an endless sea of fog hid the 4000-m. south face of Dhaulagiri from our view, but looking northwards the innumerable snow-covered mountains of Tibet could be clearly seen. Majestic Annapurna greeted us from the east and below us we caught a glimpse of the Dhaul Himal.

Thanks to the extremely favourable conditions we were able to spend a full hour on the summit, but soon enough the first signs of an approaching thunderstorm began to appear, forcing us to retreat along the narrow north-east arête. Kurt Diemberger, Peter Diener and the two Sherpas decided to stay at Camp VI, while Schelbert and I carried on to Camp V.¹

¹ End of Ernst Forrer's report.

We were particularly fortunate inasmuch as not only the advance group, reinforced by Peter Diener, reached the summit but also Michel Vaucher and Hugo Weber, although, as a result of the aircraft incident, they were rather late getting into their stride on the mountain itself.

On May 19th they had reached Camp VI, together with Jean-Jacques Roussi, but bad weather conditions forced them to remain idle for three days. They had to descend once more and the steep couloir between Camps V and IV almost spelt disaster for them. Hugo Weber slipped on the fresh snow covering the ice underneath, dragging with him Jean-Jacques Roussi, who lost his ice-axe as he fell. Only the quick reaction of Michel Vaucher, who was leading at the time and managed to belay the two others, prevented a major disaster which would have meant a tragic blow to the expedition after its brilliant success.

They finally made Camp V to find that the blizzard had nearly wrecked the tents; but on May 23 the weather suddenly became brilliantly sunny and there was only a slight breeze blowing when Weber and Vaucher once again set out for the summit. Roussi, who had lost his ice-axe, had to be left behind. Although there was only a very slender chance of reaching the summit directly from Camp V, the two climbers were nevertheless standing on the top of Dhaulagiri shortly after 6 p.m. The sun was just setting and the "White Mountain" was casting its gigantic shadow on Annapurna—a sight that no mountaineer would ever forget as long as he lived.

Looking back on our expedition we feel that the use of an aircraft, although implying certain risks, was fully justified and that the theory of gradual acclimatisation by means of approach marches was by no means infallible. However, as in the case of any mountaineering exploit, luck played an important rôle. Despite the best equipment, the most efficient team and the most careful organisation and planning, the expedition would have been a failure without its lucky star.

UNKNOWN MOUNTAIN: THE ASCENT OF TRIVOR

By Wilfrid Noyce

Why Trivor?

The choice of Trivor as an objective for 1960 was largely fortuitous. Originally we thought of Masherbrum, then veered towards something less thoroughly trodden. We plumped for Kanjut Sar, only to be forestalled by the Italians. For a time I toyed with Distaghil Sar, but was put off by Gregory and Lambert, each of whom regarded the other's route as highly unsafe. Two such pioneers in such disagreement—we gave up Distaghil Sar, or rather, as it turned out, left it to a fine Austrian party.

Then I ran into Eric Shipton. Did I know of the Hispar map made by his 1939 expedition? I did not, and hastily acquired it. Peter Mott, of that expedition, had not penetrated the Ghareisa Glacier, but a peak at its head had been triangulated, with the odd name of Trivor (25,330 ft.), a peak approachable from the west by this glacier all its own, to the east connected with Distaghil Sar, some eight miles away.

Here was our unknown, unexplored peak. So little known was it that the Survey of Pakistan, which had its height down as 24,860 ft. and was unfamiliar with the name, asked me to identify it. The name, we discovered in Hunza, is probably a corruption of Thale Var, or the Three Peaks; while the height is now established, permanently I hope, as 25,370 ft. by our survey officer Sahib Shah.

The Journey

If you believe, with H.W. Tilman, that remoteness and inaccessibility are desirable qualities in any region, but are unable to afford time to take ship to Patagonia or Crozet Island, then the peaks reached from Gilgit may fill your bill. Until the last few years these western Karakoram remained curiously unvisited, in comparison with the giants of the Baltoro. Thus the Ghareisa (or Trivor) Glacier, only two or three days' walk from Nagar village, had lain through the centuries unvisited except by a few ibex hunters. And yet this Nagar, as we read, is connected by jeep road and by telephone with the airfield of Gilgit, 62 miles

away. For those short of time but eager for novelty Trivor was the ideal objective.

The accounts of Gregory and Lambert ruled out an approach from the Hispar side, except as an extreme measure. The westward glacier it must be, but we knew nothing of it. This seemed the occasion for a reconnaissance party; and as we had secured Don Whillans, who is a plumber—a job one can evidently walk out of at will—the baggage was able to leave Liverpool with him by sea, on May 14th. At Karachi he was joined by Colin Mortlock; and these two, together with our liaison officer Capt. M. Yusuf, succeeded in clearing the hurdles that separate an expedition from the starting point of Gilgit, which at times seems remote as the moon.

Mortlock wrote of their journey. From Gilgit they had succeeded, by jeep and on foot, in reaching Nagar, but there the trouble had started. The Mir (or ruler) had supplied coolies. But once off the known Hispar track these declared stoutly that no route existed to the Ghahra, and started a series of “sit-down” strikes. A man who has not been daunted by the West Face of the Dru in bad weather is not going to put up with strikes. Whillans had kicked a porter, an unwilling move onward had been made, and a series of critical situations inaugurated which was not to end until we said goodbye to Nagar. Eventually, after threats of dismissal on the glacier, they succeeded in making a “Temporary Base Camp” three days out, from which the whole formidable prospect could be surveyed. And there, on June 23rd, the letters stopped.

The main party assembled at Rawalpindi in the first days of July 1960: Sandy Cavenagh (doctor), Jack Sadler (U.S.A.), Geoff Smith and myself. Also Oleg Polunin (botanist) and Sahib Shah from the Survey of Pakistan. Here were revealed the fatal errors of human trustfulness. The machine is *not* infallible, and we do wrong to devise tight schedules and put our trust in it. In my western simplicity I had thought, “Ah! Arrive July 4th, away by 6th or 7th.” But, first, however gallantly the Foreign Ministry might pave the way for us, the fact remained that we must buy food for 150 porters. The mountain of flour, rice, sugar that rose outside the Goodwins’ hospitable house appalled me. And when that was safely stowed and ready the weather, quite suddenly, changed. For four days which seemed years we watched black rain over the hills. Dakotas will not tackle a misty Indus, with Nanga Parbat waiting to trap the unwary.

Gilgit is hard to reach and nowadays, once reached, not easy to leave. Theoretically one saves time and perspiration by taking jeeps right up the Hunza Valley to Nagar. But this at the best of times is theoretical. In July, certainly,

the jeeps refused point-blank to go further than Minapin, one stage short. (In mid-September, as we walked down after visiting Hunza State, whole sections of the road had been swept by the Shimshal floods into the river.) And when our jeeps finally turned up, after much negotiation at 100° Fahrenheit and then thanks to the good offices of Political Agent and police, even the journey to Minapin began to look theoretical. A more broken-down bunch I have never seen, and was not surprised when one did break down, after only 25 miles. But that is another story.

As a newcomer to the Karakoram I was amazed by the dry barrenness of the first 30 miles, compared with Garhwal or Sikkim or Nepal. The rainfall here is under two inches a year. At Minapin, where we started to walk, the corn and apricot terraces of Nagar State form those "horizontal oases in a vertical desert" characteristic of this landscape. Facing them across the chasm of the Hunza River lie the fields of the rival state of Hunza, close but inaccessible. A long walk (I could never think how jeeps even dreamed of this stretch) brought us to Nagar, gateway of the Hispar. We were still connected, by a telephone almost as problematical as the jeeps, with "civilisation".

To Base Camp

I always used to be bored, reading expedition accounts, with the inevitable approach march, not realising that to the traveller this can be the most exciting stage of all. In our case it was certainly the most critical. We were met by Yusuf and Don Whillans, neatly bearded and looking very fit. The porters, it appeared, had not been far wrong in saying there was no track. Long before the Ghahra turn-off it disappeared completely, in the characteristic 50° mud and dust slope. After two days' going one was on the glacier, a rough one. After three days Temporary Base, after four the new Base, a beautiful spot in a little ablation hollow, with flowers and butterflies that made us lick our lips. There was still a lot of glacier to tramp, by way of Camps I and II, before one reached the steep rise leading to the north-west col, on the ridge between Momhil Sar (24,090 ft.) and Trivor. This col, perhaps 22,000 ft., Don had just managed to reach. More important still, though it was separated from Trivor by a ridge about two long, this ridge did not look insuperable. The problem was to get as far as Base and look at it.

I had already asked for six high altitude Hunza porters from the Mir of Hunza. The Nagars have some way to go before they become successful carriers high up, but the Mir of Nagar had kindly ordered us 150 coolies. This monstrous

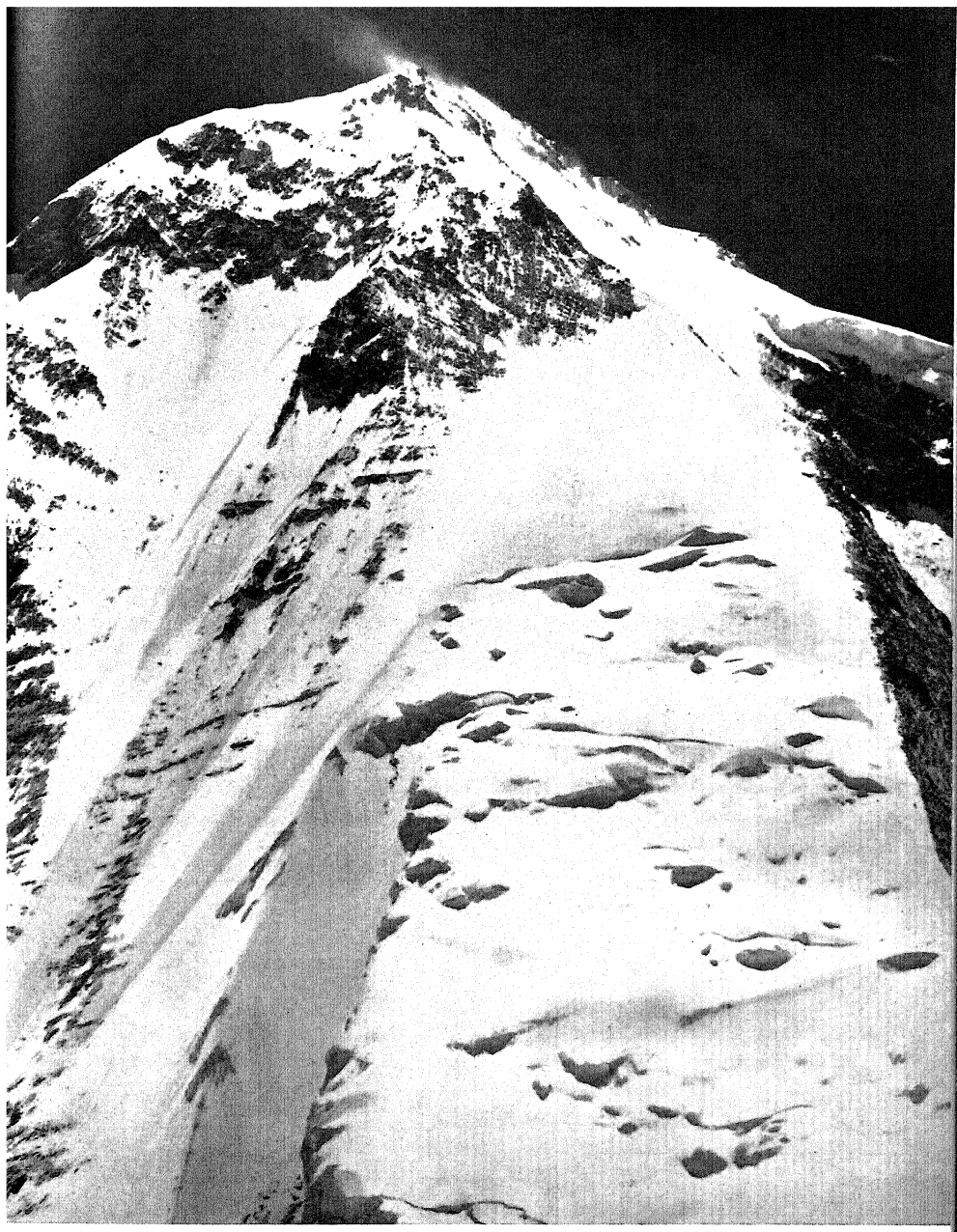
army was needed to carry, not only our own kit and food, but the great edible mountain which each expedition, nowadays, is required to fly in for its porters. To help the weaker brethren over the first stage Whillans set off early on the 19th July from Nagar, with stakes and ropes for fixing; but even so the unstable dust slopes provided their thrills. I could only admire the way the advance party must have coaxed or bullied over thirty porters across great sweeps of rocky rubble that gave awesome glimpses down into the Hispar River, grim fate of anyone who slipped.

The first camp we made among the boulders of Gharesa. Next day, without great difficulty, we reached the glacier snout up the valley. On the third we were on the glacier. Though it is no more than 10 miles in its whole length, a mere baby brother to the mighty Hispar of over 40, the Gharesa Glacier gives you the impression of big country. And it was new. Some of our men had been up with the advance party, but they all made heavy weather of this boulder-strewn, mildly crevassed highway. They were jaded and quarrelsome by the time they drew out at Temporary Base, perched 200 ft. up on a grassy ledge overlooking the glacier (13,500 ft.). Somewhere round here our sugar started to disappear alarmingly, another worry for Geoff Smith, who had the key job of food. They demanded extra pay for difficult glacier work, and started a splendid fight, sticks flashing, with the Hunzas, because Ali Gohar had remarked casually that Nagars were the idlest, most villainous bunch of so-and-sos on this earth. In deepening dusk we all plunged in, and the fight stopped. Nine out of ten had no idea what it was about anyway.

From Temporary Base, where Mortlock met us, one had a superb view of the glacier over most of its length. But one still could not see Trivor; indeed Trivor is a shy mountain from any side, hiding coyly at the head of its glacier. When seen from this angle it tries not to reveal its true summit, but a rock shoulder which may have given the Survey its impression of 24,860 ft. The last stage, to Base Camp on the left (true right) bank, was accomplished without incident, mainly because the Nagars were anxious to get back to Temporary Base where they had left their wood and atta.

"Advance Base" established

Base Camp (14,700 ft.) was a charming spot, on level ground by a little stream, sheltered on one side by the moraine separating it from the Gharesa Glacier, on the other by the scree and rock cliffs of Peak 22,170 ft. One still could not see Trivor, hidden by a sharp little cliff whose base we must traverse in order to regain the glacier.



40 SUMMIT OF DHAULAGIRI (26,976 ft.) with North East ridge, seen from North East Col (18,700 ft.). (Photograph by Swiss Himalaya Expedition 1960)



41 MOUNT TRIVOR (25,330 ft.), Hispar Mustagh Karakoram, first ascent by a British-American expedition 1960. (Photograph by Sandy Cavenagh)

We had divided into two parties, one having 100 coolies, the other 50. The first arrived on July 23rd, the second next day. Obviously, the first duty was to hump as much as possible up to Camp I, and thence to Camp II. These camps had been sited, but not established, by Whillans and Mortlock, who had left a dump between them. So deceptive are Himalayan distances, they had thought to reach the site of our final Camp II, below the north-west col slopes, in a day from Base. They camped in a crevasse; next day, by a great effort, Whillans managed to reach the top in knee-deep snow.

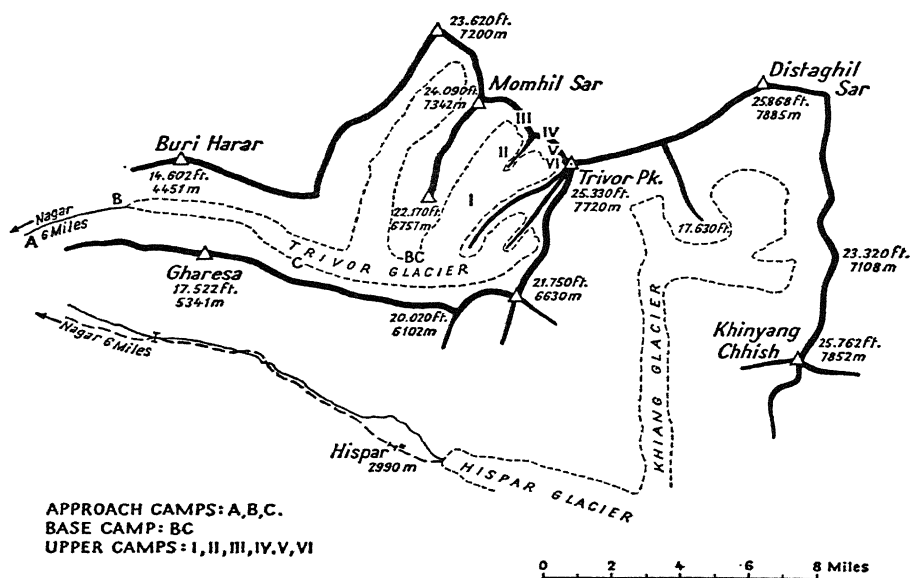
When we tramped up with the first "carry" on July 25th, most of us found Camp I (17,000 ft.) quite far enough. I always marvel at those leaders who, weeks in advance, can make a day to day programme: "5th day, A and B, plus porters 1, 2, 3 and 4, to Camp III. Down to Camp II." When I look at the sheets I covered with scribbles, and the number of times I changed even these modest prophecies because of weather, sickness, manpower available, I am in despair. In very general terms I planned to spend the first week, if necessary, getting everything to Camp I. During the latter part of it Whillans and Mortlock, both acclimatised, would take the two best Hunzas to establish Camp II (20,000 ft.) and start in on the steeper slopes to Camp III, which would be on the col. As soon as possible the whole climbing party would move to Camp II, which, in its nice flat hollow, would make the ideal Advance Base. We would then be self-contained with four Hunzas, sending down the other two for work with the liaison officer, Capt. Yusuf, whose post would be at Base, and the botanist, Polunin, who planned finally to make an exit over the Ghareza ridge to the Hispar with our invaluable survey officer, Sahib Shah. For the moment both of them had enough to do finding plants and selecting observation points nearer at hand.

Though it became monotonous after five days with a heavy sack, I found the walk to Camp I exciting. First boulders and grass spangled with primulas, then crevassed debris as one struggled to the centre of the glacier, then a long walk up swelling ice, spattered with a myriad T-tables; finally a steep, breathless rise of 500 ft., the first icefall, to the level bump which was to be Camp I. The weather, all in all, was kind, as it was to remain throughout. Nothing in our days at Pindi and Gilgit had depressed me more than the regularity with which people said, "You're very late in the year, aren't you? Oughtn't you to have come earlier?" I was not comforted until Sahib Shah told me that he, after seven visits to the Karakoram, reckoned July, August and September to be the best months. Certainly we had stretches of two or three days' bad weather. But no

more than that, and the snow, when it came, was not the all-engulfing stuff that buries camp sites.

The chief enemy, in these early days, was heat. We would start early, at 5.30, sometimes in mist, to be down by one or two, after which time movement became a torture. As one trudged up in the sunrise one had the impression of penetrating a great secret valley. To the right the towering cliffs that drop from the rock shoulder of Trivor. Sweeping down to the left, and continuing its long course over many ups and downs, the ice ridge which we must traverse from our Camp III col. This had inconsiderately placed itself at the farthest possible point from Trivor, right under Momhil Sar (24,090 ft.) which reared its impressive ridge of ice and rock straight from the col. As the sun rose, avalanches boomed down into the valley; but the troughs caught them, the icefalls up which we wound turned out very safe.

One would be back at Base in time for a late lunch, usually in the sun even if we had had hail the night before. Our carrying force varied. Sandy Cavenagh (doctor) was ill at this time, but in addition to the Hunzas we had two Nagars, taken on as high altitude porters at the request of the Mir—a not altogether successful experiment. Then there was Pervez Khan, an enterprising student



Mount Trivor and Surroundings (Karakoram, Hispar Mustagh), (after Wilfrid Noyce).

from Lahore, who came out quite on his own and eventually reached Camp II with Yusuf. On July 28th we were sufficiently advanced for Whillans and Mortlock to stay at Camp I; on the 29th they made Camp II. Sadler, Smith and myself established ourselves at Camp I, but were joined by Mortlock, on his way down with a bad tooth. This tooth he had extracted next day by a very seedy doctor, who decided it might be his own trouble and persuaded Polunin to do the same for him.

The weather during these next days looked curiously threatening. Huge cloud battalions massed from the direction of Rakaposhi in the south-west. Obviously there were blizzards somewhere, but on us they only dribbled, or lashed us with short sharp hail. By evening the mist would draw aside, revealing Trivor a wonderful horned mountain, jewelled with new snow.

Certainly our advance to Camp II was not hindered. The route at first was interesting, through the upper icefall, in and out of crevasses, relieved by ice work where steps had to be cut. Then an intolerable plod, two hours of it, with the tents hidden till the last moment. But as I arrived on July 31st, breathless as usual under my load, I had a vision of two black dots on the dazzling whiteness above, a curtain of snow rather like my impression of the North Col of Everest. This must be Whillans and the Hunza Ali Gohar, who had stayed with him, pioneering the route to Camp III on the col.

It snowed that afternoon, as it often did, robbing Sahib Shah of his one opportunity to fix our heights really accurately from Camp II. Down at Camp I, I made final plans for the move up to Advance Base. For a few days there would still be a ferry from Base, then Cavenagh would come up with the last loads. On August 1st we said goodbye to Sahib Shah, soon bound for the Hispar, and stepped out to higher things. This is perhaps the place to record that he and Polunin made their exit over the ridge in good order. At and above the Hispar Glacier Sahib Shah completed his survey work: in all he obtained 700 survey points, while Polunin collected a wide variety of plants.

Camp II was a friendly place, and we always felt more at ease without Base Camp followers. Perhaps this was as well, since we were at once held tent-bound by two days of snow, albeit a snow not heavy enough to stop Sadler and the Hunzas from bringing up loads from below. We ate and read. I worked out endless schedules which I knew would not come off; or simply lay and watched the drips down the tent roof, and wondered what it was all about. What does one think of at these times? Of the weather, of the next meal, of whether the porters will get through today; mostly of practical things, I find, not of the

"visions beyond compare" that are crowding on every side. One thing I was determined: on the 4th we would do our utmost to get the ridge camp, Camp III, established.

The route to the col, which had taken its pioneers over five hours, was divided clearly into two stages. First, steepening slopes of floury snow. About two thirds of the way up the eye met one of the most impressive crevasse lips I have ever seen, some hundreds of yards long and horizontally streaked like a Neapolitan ice in all its overhanging length. Whillans, a small automaton in pink anorak and cap, ploughed tirelessly up to the crevasse. Four hundred feet of fixed rope eased the last stretch, and we rested under the overhang. I rashly took over the track-breaking from here, regretted it, but was too proud to say so. In mist, with a wind blowing, this upper third of the face looked miserably uniform. It was hard to see where, bearing right to a mythical line of horizontal rock, one was going to hit the col and miss the great bulk of Momhil Sar above. The final section, a long ice shelf below the rock, had been well protected with rope by Whillans and Ali Gohar.

At the col, a grey little flatness swept by gusts that tickled us up the trousers, Whillans and I waited for the others. Loads dumped, we dug out a tent platform of a sort. After three quarters of an hour, at 2.10, Whillans looked back over the shoulder that hid them and reported no one in sight. They could only have stopped at the crevasse. Rather cold and in something of a temper we stamped down the misty steepness—to find the tent pitched and Mortlock, Smith and Akbar, our best all-round Hunza, cheerfully ensconced. This was the nearest we came to a quarrel that I can remember. Don Whillans had "been up to this bloody col three times" and had hoped that today would be the last. I felt our effort had been wasted. Mortlock pointed out, with sweet reasonableness, that Akbar had not been going to make it, Smith was not yet acclimatised, so that the camp had not been feasible and they had stopped. We descended in silence to Camp II.

Events proved the delaying party to be right. The 5th, a snowy day, was enlivened only by mail which Cavenagh, weak but determined, had brought up. On the 6th however, starting before 5 a.m. to avoid the heat, a party of six reached the col in fine, blowy weather and dug a trench in the hillside for a 4-man Meade tent. Here we left Whillans and Mortlock with the job of reconnoitring the long horizontal stretch of ridge to Camp IV.

The other Hunzas, meanwhile, were arriving with the last loads from below. Now we were self-contained, with enough to last as long as we could need. The

only disadvantage, I discovered, of this method is that if you climb the mountain ahead of schedule, you have to carry everything down again. On the 8th, with the help of four porters, three more climbers were installed permanently at Camp III, Cavenagh remaining below to bring up another "carry" later.

As we brewed tea there was a sound of voices: Whillans and Mortlock returning from their second day along the ridge. Anxious enquiries. The ridge would certainly be a tough nut, but they had reached a spot more than half a mile along, where Camp IV could be placed. Over the last, icy stretch to it they had fixed more than 350 ft. of rope; but even so there was no question of taking Hunzas, inexperienced in crampon technique, along it. They would have to wait at II, and keep communications alive.

It remained once again to make a plan. Whillans had been a spearhead and I knew would remain one. He was very fit. Who was to go with him? Mortlock, I had thought, but he had already told me that he would do the ridge reconnaissance, but then preferred to be of the support party. Smith, who had been very high on Masherbrum in 1957, had not acclimatised yet. Sadler was far from well. An ulcer at the back of the throat made it painful to eat and frequently necessary to vomit. There was no one for it but the leader.

I had not intended to be in the summit party, reckoning the place of a middle-aged leader to be in the middle. But once the decision had been made I felt happy, relaxed, rewarded, like a boy who has refrained from stealing apples and has then had the juiciest presented to him on a tray. Apprehensive, too, for even from here we could see that the last 2000 ft. of the mountain were not a walk. One could only go and have a look.

The views from this level ridge next day were incomparable. There below us, to the north, the Momhil Glacier wound majestically towards the Shimshal. Over the way rose the lumpish mass of Distaghil Sar (25,868 ft.). I could not help smiling smugly as I compared it with the elegant pyramid ahead, and felt secretly glad that we had left it to the Austrians. To the south a wonderful army of peaks arrayed itself above the clouds, culminating in the mighty triangle of Rakaposhi. But the ridge itself was soon too serious a place for loitering. At first broad and comfortable, edged with mighty cornices, it dropped (maddeningly) almost 1000 ft. to a gap, then climbed laboriously to a rock knob, "Black Rock", after which it became level and icy and sharp, having on the left a huge drop of curled mushroom and whipped cream, reminiscent of the Andes. Jack Sadler, who had come without crampons because the straps did not fit, danced like a marionette on the fixed rope and retired discomfited. Mortlock and Smith,

having struggled on to the "Camp IV drop", were glad to dump their loads (2 p.m.) and start back before it got too late. It was left to Whillans and myself to set up Camp IV.

The point we had reached was the end of the level, if sharp stretch. From here one looked down to a col, perhaps 600 ft. below, from which the real bulk of the mountain seemed to rise. About 200 ft. down and also—depressing thought—at least 500 ft. lower than Camp III, the mixed snow and ice slope seemed to level off a little near the cornice, suitably for a camp site (21,500 ft.). Appearances are deceptive. It took two and a half hours hard digging to excavate a platform for the tent. There were very few inches to spare. From this tent we surveyed the last lap.

The crest beyond was impressive. From the col, far below our level, the next bastion sprang up, rock to the right, narrow snow cornice bending left, to end in a two-headed tower that stared at us in an unfriendly way across the gulf. This would be the crux, and we might spend several days on it. On the 10th, armed with a long rope, we assailed the tower. An abrupt little hump, then a first uprush of ridge, steep and awkward rock, though not technically difficult. Whillans, in the modern fashion, had no hesitation in opting for rock rather than the sinister bend of snow to its left. I was delighted to be led by him. A second rock uprush, and I took over on tilting, slightly loose blocks. At the first head of the snow tower a sharp, level crest led on. After a while I adopted the riding position, giving thanks for my untearable waterproof trousers. But Don, still with an eye to rock, saw that we could more easily avoid the ice crest by a short abseil on the right, and thence work along the top of the south-facing cliffs. Soon we were on the second head, gloomily facing yet another (mild) drop, before the flatter face of what we hoped was the really final Trivor rose above. We decided it did not look too difficult, we had done enough for the day, and went down.

Unless I am really anxious, I find a day "confined to camp" by snowfall very restful. The 11th was such a day. A slight anxiety there was, since the others, tired or not well as it turned out, had failed to get along the ridge. But Proust I found most soothing, and the sort of easy conversation, about climbs and climbers, which passes the hours. In the intervals I find camp chores can take up almost any length of time. Don spent hours rubbing Vaseline on his sore nose and lips.

It was a surprise when the 12th dawned fine, and we prepared to receive the others with their loads. Don started a mighty digging operation designed to

make our platform take a second tent. I enlarged steps in the tricky little snow-covered ice slope above, then went on enlarging all the way back to Black Rock, whence I could see the whole length of the ridge. Nobody in sight! I sunbathed for half an hour. Yes, there they were, at 10.30, descending the long slope. I went back and announced that they would be here in about an hour and a half.

The hours passed. Twelve o'clock... two o'clock... half past three. They must have given up. The weather was now perfect, it might hold for four days, just long enough for the summit. It seemed unreasonable to expect more. We should take at least something up tomorrow, to the site of Camp V. It was at half past three that Don said:

"Should we go back and see?"

Of course we should, but... We struggled out, at 4 p.m., back to Black Rock again. Only this time it was the afternoon sun, and there, far off, on the last hump of the ridge, two dots could be picked out trailing with infinite slowness towards Camp III.

"What about going down to the loads? They must have dumped them down there."

Seven hundred feet in soft snow brought us to the loads, perched forlorn at the lowest point of the ridge. We extracted tent, primus, fuel. The 700 ft. up again were lightened by sunset and a cool breeze. Now at last, with these stores, we seemed set for the top.

But no. In the night Don was not well, complaining of "growing pains" in the legs. In the morning he still felt unwell, but was not going to let it stop him. The route above the towers, with our loads, was more troublesome than it had looked: very steep snow, knee-deep in some places. Despite the legs Don was taking more of the lead than I, and seemed to be going very strongly. We were just coming up to our objective, a sharp little castle of rock on the right hand edge of the upper face, when his legs gave out altogether. He lay panting and distressed in the charming little dell that nestles under the lee side of "The Castle" (22,100 ft.). Then we started down.

On the descent we fixed ropes down the towers, and used them for abseil. The 400 ft. up to Camp IV were an agony to Don; but this time there was Sadler to meet us with lemonade, and Mortlock brewing in the tent. They explained the delay of yesterday, due to illness and an accident; also the difficulties of communication with Camp II, which had sent the two of them down to visit it. Don collapsed but would not give up the idea of tomorrow. We arranged that the other two would go back now, and make a 4 a.m. start from III to reach

us soon after 7 a.m., with all the remaining gear for V and VI. When they had gone I took Don's temperature. It was 101.

The Summit

Obviously, there was no question of his going up. But in the morning the temperature had dropped to 100, and the weather remained superb. It was a hard decision. At 7.15 Sadler and Mortlock appeared faithfully over the skyline. They reported that Geoff Smith and the doctor would be along today. That made the decision easier, and sensible. With what these had brought, we now had enough to stock both top camps, but no mattress or sleeping bag for Sadler, if he came on with me. Don gallantly sacrificed his own until such time as the others arrived. At 9.30 a.m., after hectic packing, Sadler and I started off. Mortlock generously agreed to stay and nurse the patient.

The climb, with much gear for two camps on our backs, was hot, but thanks to the fixed ropes not too difficult. We arrived at 1.40, pitched the tent and set about the serious business of hydration. Camp V was beautifully placed: sheltered under the Castle, and yet by walking a few yards to the edge one could look right back along our ridge, admire the obelisk of Momhil Sar, or Rakaposhi, backed by the cloudfilled valleys of Chitral. That evening I tried out our elaborate system of torch signals with Camp IV, clearly visible across the way. They failed completely to work, and it was not till we reached Camp IV again, on the 18th, that we learned what had happened.

First, Sandy Cavenagh, descending the steep, snow-covered ice above IV, had shouted cheerfully that he was coming, and immediately taken a header—fortunately into a convenient patch of soft snow alongside the tent. His memory of the subsequent diagnosis was confused, but he suspected an attack of poliomyelitis. We had all been inoculated, and this may have saved Don. To get a helpless man back along that ridge would have been desperately difficult. As it was, after the prescribed 48 hours on his back he felt better; and when he came to make his way back along the ridge, moved so fast that his companions could not keep up. At the time of writing he is on the way back to England by motor bicycle, alone.

Don Whillans, in 1957, had climbed to within 500 ft. of the top of Masherbrum. Now, by an equal stroke of ill-luck, he was deprived of Trivor, to which he had reconnoitred the route and which he of all of us most richly deserved.

My chief worry over our ridge was its length, since the total distance from Camp III to the summit must be well over two miles. The possibility of being

caught out by really bad weather was unpleasant. That evening of the 14th a red sun cut the calm brown haze behind Momhil Sar, every peak sank quietly into the promise of a perfect morrow. But never was promise more blatantly broken. Pushing back the tent flaps next morning we were disgusted to see grey streaks, then huge black clouds massing from the west. Jack, after a meagre breakfast, was forced to vomit. Things looked bad all round.

Eight o'clock passed to nine. We sat despondently and wondered. Then, in the way that weather has, little shafts of sun broke playfully through the dun ceiling, the masses looked not so solidly black as before, the day seemed none so bad after all. I said:

"Perhaps it would be a bit feeble not to go up and at least look at Camp VI."

Jack felt a little better, having got rid of his breakfast. At 9.35 a.m. we were tramping out of the dell, on to a broad-backed ridge. To my surprise, our ridge still refused to flatten out into the final broad mass of mountain, up which we reckoned we could choose our line. Indeed we soon came to two enormous, globular ice bulges on it, which we did well to avoid; then we descended to a last little col, 22,400 ft. The day was now windier and woolly cloud scurried across the upper layers of the face. To keep up morale, we had eaten a precious tin of sardines. We had now no excuse for not slogging on upward.

Gradually the sun gave up the struggle. A light snow began to fall. Winding a way up steepening snow-ice, we were heading for a triangular hanging glacier, wedged between the broader face upon which we were, and the sweep of rock precipice dropping to the Gharesa Glacier on the right. But the ground near this triangle became steeper and more broken. We began to drift left of the ridge, out of the biting snow. A crevasse, for shelter! We passed several, then, suddenly, I remember shouting "This is it!" Here was Camp VI (23,100 ft.).

The crevasse allowed entry along a narrow shelf. This widened into a ledge overhung by a splendid eave from the slopes above. Wind-drift it received constantly, but not the blizzard snow. The ledge just took a small tent; then disappeared into further depths. So sheltered was the site that next morning, looking out, I could see only the stillness of a grey dawn and suggested starting then and there. I scrambled out of the crevasse, to be greeted by a young blizzard which contained us all day in camp. Jack, manfully fighting his throat and stomach, slept much of it. Having had to leave Proust below, I did the same. In the intervals we dug out the tent, buried from time to time in wind-drift.

We had not much to eat, but did not need much. In the morning I had thought of going down; Camp V could not be more than 1000 ft. below. At

about 5 p.m., however, the miracle happened. The wind dropped, the sky cleared. From the crevasse rim the peaks could be seen striking up once more like great standards into the gold of a splendid sunset. Behind Momhil Sar I saw, for the first time, the bold forms of the higher Batura Mustagh.

This was it. I slept badly, and at 4 a.m. started fumbling with the primus. Things took a long time. It was not till 5.45 that we climbed out into the sunrise, starting with a difficult step or two up the overhung lip of our crevasse. Yesterday's snow lay thick, and for an hour we waded in it nearly to our knees, making always towards the lower of two prominent rock ribs, one above the other, that split this last section of broad face vertically. I guessed that we could use them to get off the snow; but in fact the first rib was steep enough for the snow to be hard at its side. Some long, ankle-tiring crampon work and at 9 a.m. we stood in sunlight on comparative flatness at the top of the first rib. We stopped for food, and to rub Jack's toes, which felt cold. In the event three were slightly frostbitten, and some fingers. Throughout the day he hung on, fighting this and his internal troubles, in a way on which I dared not comment, but for which I was intensely grateful.

One feature of Trivor was its way of producing the surprise difficulty which yet proved superable. No stretch beyond Black Rock could be called easy. From our resting place the last 1000 ft. or more looked straightforward. We could either take the slopes on the left, or the upper rib itself, or the easier-looking slope to its right. As we trudged the few level yards it all began to look much steeper. We tried the slope on the right, found it not so good as it looked and were glad to get on to the comparative safety of rock. This rock for 150 ft. proved difficult, particularly in high altitude clothing, then broke into a jumble of unstable blocks. But these seemed to lead directly to the summit ridge, which looked deceptively close.

The weather had smiled on us. But now, for no reason at all, light clouds came drifting over the summit ridge in our direction, enveloping us first, then spattering snow upon us. At 12.30 p.m. the ridge looked no nearer, and I knew we had a trudge along it to the summit itself. We stopped grumpily to eat sardines, snow drifting into our breathless and despondent faces. Then we went on. We seemed to be climbing endlessly, energetically, and to be getting nowhere.

As we heaved wearily over the last feet of the summit ridge a second miracle was happening. The cloud, for no reason at all, scattered, rolling back in great silver-tipped billows over Rakaposhi and the far ridges. The sun shone once more. The time was 1.15. "An hour at least to the top", we said, and started

out along the ridge. It was an hour and a half before, panting hard, we trod the final sharp cone and looked down into the great basin of Distaghil Sar.

I have never felt gladder to be on a top. Distaghil Sar itself still looked shapeless; but to its right Khinyang Kish (25,762 ft.) reared up a noble rock pyramid; and behind that loomed two other great towers, Pumarikish (24,580 ft.) and Kanjut Sar (25,460 ft.). Below, immeasurably below, we caught a vignette through cloud of the mighty Hispar. Thence the eye rose to the rippling skyline which brought us to Rakaposhi again, and beyond, behind Momhil Sar and the ferocious Batura, the Pamirs in Russia looking like fairy castles floating on a mist.

But we could not stay long. At 3.00 p.m. we stepped down, back on to the summit ridge. We had often noticed that our ridge of the mountain received the full evening sun in all its length. The sky cleared slowly, and as we chipped and crawled our way down rib and slope, new visions of hidden valleys, or of peaks burnished with gold, opened before us. But by now we had only one thought, to get down safely before we were too tired. As the light drained from the sky and cold gripped the fingers we were struggling down the last slopes, slithering over the crevasse, and at last, after nearly 14 hours out, hailing the twilight welcome of that small square of canvas, Camp VI.

Conclusion

Next day, the 18th, the fuel ran out at breakfast. There had been no sign of anyone, and we descended to Camp V. Still no sign. We wondered whether to stay here but decided to push on, finding the fixed ropes, and particularly the abseils, exasperating with enormous packs. As we toiled up to Camp IV, at 4.30 p.m., we were vastly relieved to be greeted by a shout—from Mortlock, who had stayed on for us. From him we learned how Whillans, finding himself in order, had gone back along the ridge, to be met and escorted by Smith and Cavenagh. He would make Base as soon as possible. By the 21st I reckoned that the rest of the party should be there too.

It remained only to bring down everything from Camp III and below. Much of this chore could be done by the Hunzas, and for a day or two I was free to explore the side valleys of the Ghareisa; failing to find an exit over the high cols, but filled with the lonely majesty of this corner of the Karakoram. I was even more deeply impressed with it some days later, on a solo exit over the Ghareisa ridge to the Hispar, whence I was to join the others for our visit to Hunza State. Lovely as were the peaks and distant highway of the Hispar, it was a slithery,

boulder-strewn dusty journey which I should not care to repeat—yet which I would not have missed.

For I had leisure to reflect on the way of expeditions. I could not help wondering if we, who choose our “remote and inaccessible” peaks from a map, and then strive for months to reach them, for weeks to climb them, regarding every drop or detour only as an unwelcome delay, do not risk missing something even more important than peaks. We are missing the country. Sitting by the muddy Hispar, alone, away from all the impedimenta of an expedition, I seemed to see myself for a moment as a traveller who had failed to travel, who had given his everything for a prize which any solid hewer of steps could have won.

There are two worlds in mountains. And when I thought of the fun and companionship, of the cloud-capped visions and the joy of achievement, of the sheer beauty of Trivor, I knew that I had at least had the best of one.

RUWENZORI

By Dölf Reist

January 8, 1960. The aircraft makes a wide sweep over Lake Victoria as it comes in to land. At Entebbe Aerodrome, Mr. Pasteur, Secretary of the Mountain Club of Uganda, awaits us. We repack our equipment at his home and towards evening he drives us into Kampala. The asphalt road is lined on both sides with big native settlements of mud, straw, or even corrugated iron roofed huts. Brawny figures sit in the shadows. Women balancing whole stems of bananas on their heads and carrying children on their backs make their way homewards. We reach Kampala. At the railway station, natives all anxious to earn a few cents pounce on our luggage with excited yells. Then we enter the hot compartment and begin the 220-mile journey to Kasese. Inquisitive crowds are gathered at every stop, the women swathed in picturesque, gaily coloured cloths. The train rumbles steadily through the starry night across bush and plain.

On reaching Kasese next morning we are met by Mr. John Graham from California. He has engaged Felix Julen, of Zermatt, as guide for his planned three-week expedition to Ruwenzori. My job is to complete the film "Africa's Highest Peaks", for last year the 63-year-old American climbed Kilimanjaro, Mawenzi and Mount Kenya with Felix Julen and Erwin Aufdenblatten. Subsequently they went on to the Ruwenzori range. But because of bad weather on Mount Alexandra they called off their plan to climb the main peak in the group.

From Kasese we go by Land Rover to Kilembe power station. Mr. Lynch, the superintendent, kindly lets us have the use of a storage shed, where we can get ready all the equipment needed for the expedition. He gives us further help in choosing 27 porters and Simoni, the head porter, an imposing figure of a man. Each Bakonjo (porter) is given a load of 44 lbs. and a blanket and pullover for his personal use.

Ruwenzori is shrouded in black rainclouds. The natives at one time called it "Runssoro", meaning "Rainmaker" and even today it is said to rain 360 days out of the 365 on Ruwenzori!

Our cases containing suits and white shirts have been left behind. We have

come to the end of the road and soon the dense jungle of elephant grass swallows us up, a confused tangle in which the track is barely traceable. Many droppings and deep imprints in the swampy ground betray the presence of numerous elephants.

The jungle soon gives way to alpine forest. With ferns 12 feet high forming an archway above our heads, we plod up the steeply winding path. It is hard going and the clammy, hot climate is punishing, so we heave sighs of relief when the Nyinabitaba Hut comes into view. This hut, like all the shelters on Ruwenzori, was put up by the Mountain Club of Uganda.

From here the terrain falls away abruptly to the confluence of the Mobuku and the Bukuju, and soon after leaving the hut next day we wade across this obstacle, waist-high in water. Unpleasant as this is, worse is to follow, for now a monsoon-like rain sets in, rapidly turning the swampy land into a bog. We force a way through bamboo thickets, clamber over rotting tree trunks and slippery roots, wade through evil-smelling pools of water and are soon drenched to the skin and plastered with mud. The porters are used to these arduous jungle conditions. I admire them as they press on, barefoot, effortlessly putting one obstacle after another behind them and keeping their balance with the aid of long bamboo sticks.

For hour after hour we plod on laboriously. The heather, or Erica as we call it at home, is present here in the form of trees growing to heights of 30 to 50 feet which dominate this zone. Long, silvery beard moss hangs among the branches, giving the trees a strange and grotesque appearance.

We reach the Nyamleju Hut and after supper sit with the porters beneath an overhanging cliff, watching them cook their mealie gruel on an open fire and broil rock badgers over a spit. It does not look very appetising and we are glad that they do not invite us to share their meal.

The third day's march brings us to Lake Bujuku and the hut of the same name. The climb is long and monotonous, for the inevitable rain is falling and we also have to cross two marshes which I shall never forget as long as I live. The marshland is dotted with sedge and to avoid having to wade through mud we jump from clump to clump, ever on the alert to avoid missing these precarious footholds. This is exhausting and we often miss the clumps or lose our footing, finishing up in the mire. The mud splashes high into the air. Yesterday we sank up to our ankles in the swamp. Today we sink up to our knees! By now apathetic, we barely bother to glance at the wonderful lobelia and senecio, growing to heights of 16 feet in these parts. Patrick Synge, the botanist, describes

these as "the most exciting and strange plants" that he has ever seen. They grow in large numbers on the shores of Lake Bujuku at a height of about 13,000 feet. At long last we reach the hut. For a long time before dropping off to sleep I can hear the steady pattering of the rain.

The hut lies in an enchanting senecio wood, facing the peaks of the Stanley Group. Next morning we see them drenched in bright sunshine and sparkling against a blue sky, the dark waters of the lake mirroring their ice-covered heights. I have hardly had time to take a few photographs before Mount Baker's Summit is again obscured by grey clouds. The mists swirl over the Stanley Plateau and blot out the highest peaks. Soon it begins to rain again—real Ruwenzori weather! Mr. Graham has paid off 20 porters. Unable to write, they "sign" for their wages with thumbprints. These men will make the descent today while the remaining seven make preparations in their dens for a fortnight's stay. Each is given a pair of light galoshes and a pair of socks for the ascent ahead.

Next day Felix and I climb to the Elena bivouac to reconnoitre the ascents before we begin to take photographs. The two sheet aluminium huts stand 14,500 feet above sea level right by the tongue of the Elena Glacier. It has come on to rain again and not until midday the next day do the clouds disperse from the mountains. Quickly making ready to move off, we climb optimistically up to the Stanley Plateau, only to find that the weather has not cleared for long. Tramping through the mist across the broad plateau, we mark our route with little red flags and soon arrive at the foot of Mount Alexandra.

Enormous snow cornices and cascades of ice traverse its snowy flanks. Strange rime and icicle formations hang between them. This is a typical phenomenon on Ruwenzori and is due to the permanently bad weather and the great fluctuation in temperature. We press on, the going being steep now, until a level offers the chance of a halt. Yard by yard, Felix works himself up over the perpendicular rise. An ice piton halfway up acts as a safeguard. The ice resounds with muffled thuds beneath the strokes of his axe and when he cuts big steps, the ice layer breaks and through the gaping hole we can look down into black abysses. After negotiating one more barrier we reach the ridge, along which we make for the peak (16,700 feet). The impenetrable grey offers no visibility and we peer vainly northwards where the proud Mount Margherita must rise a few hundred yards away. Climbing down the north flank we reach good *névé* in the broad saddle between Alexandra and Margherita. A momentary gap appears in the mist and we spot a large gully going up from the Congo side, west of the saddle, to the summit. We make a quick decision, for this seems to be the shortest route.

The crampons grip well but the gully becomes steeper and steeper, and Felix hacks out steps in a way that is a joy to behold. Clinking ice splinters disappear into the mist below us. Farther up, we move over to the rocks. The crampons grate on the stone, and the wind roars over the summit ridge—it cannot be far above us now. A few minutes later the outlines of the peak loom out of the mist. It is a fragile formation of windblown snow and rime, festooned with long icicles. Cautiously, one behind the other, we clamber up the last few feet—to reach the summit of Africa's fourth highest peak, 16,790 feet above sea-level. From here there must be a wonderful view of Mount Speke (16,117 feet) and Mount Baker (15,983 feet), and down to the numerous mountain lakes round Ruwenzori, but dense mist swirls all round and we can see nothing.

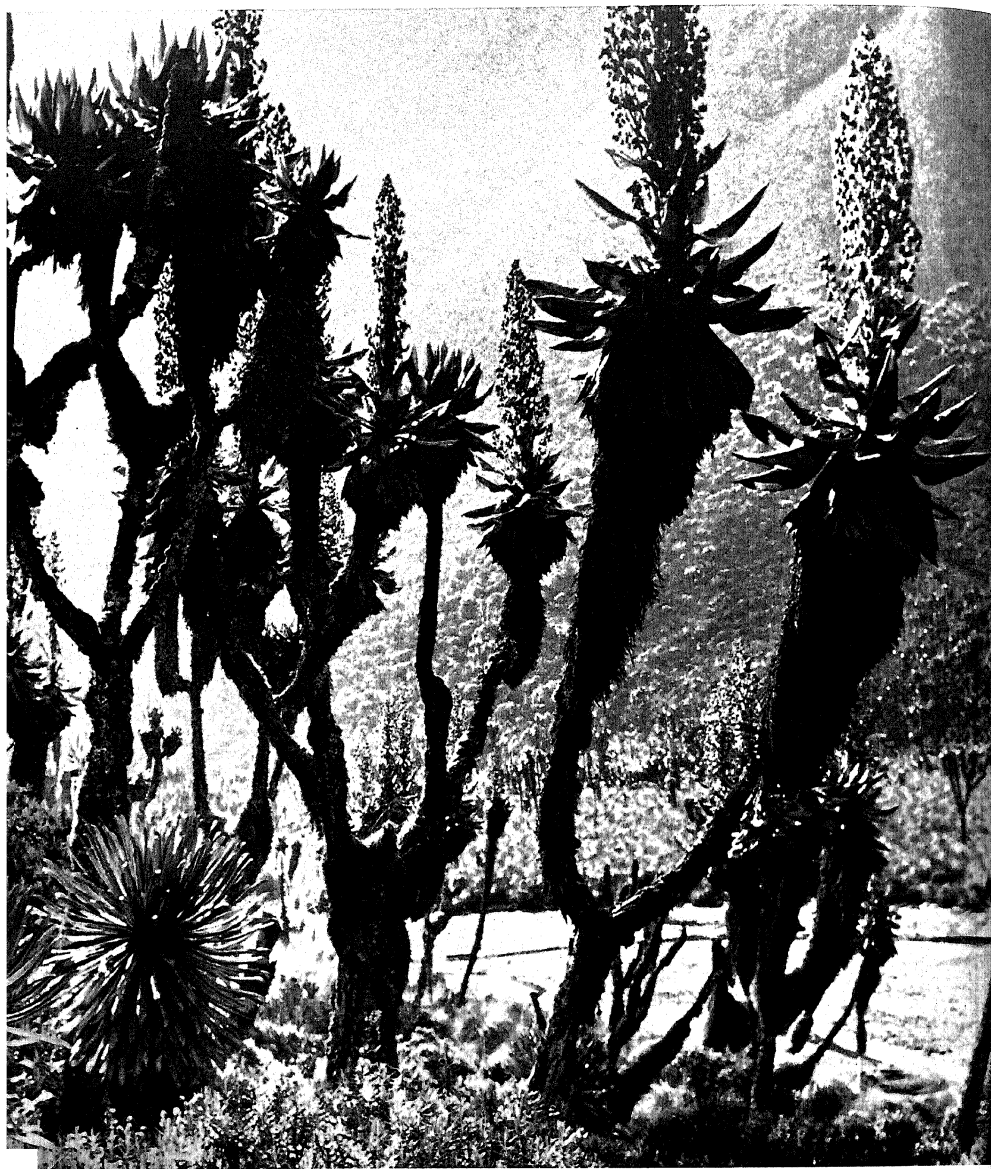
The third peak, named after King Albert of the Belgians, can easily be reached from here. We are there within a few minutes. Afterwards we return to the Elena Bivouac by the same route.

We make this climb again five days later. It is a wonderful morning and the peaks soar above the Stanley Plateau in radiant beauty. I have a lot to do, for these sunny hours must be used to full advantage. While Mr. Graham and Felix tackle Mount Margherita, usually a few rope length ahead of me, I keep changing position to film the ascent. Not even the tiniest cloud spoils the distant view, and our gaze travels over peaks and valleys to the endless far-off plains of the Congo Basin. These are happy hours, for few climbers have been so lucky with the weather on this mountain.

There are nine peaks in the Stanley Group. Most expeditions aim at Alexandra, Margherita and Albert, to the north, while few make for the southern group, which includes Elena, Great Tooth, Savoia, Elizabeth and Philip. The ascent routes to their peaks are very steep and snow conditions and weather very largely determine whether they can be taken. Mr. Graham's aim is to climb all nine peaks, so on the next clear morning we again ascend to the Stanley Plateau. The temperature is 14 degrees below freezing point. We make quickly for Alexandra to photograph the sunrise from there. Soon after 7 a.m. the sun's fiery ball rises above the distant horizon; mountains and glaciers turn red and every little wrinkle in the snow throws long blue shadows. Going back over the plateau and north of Mœbius (16,154 feet) we climb down several hundred feet on the Congo flank to reconnoitre the western ascent to Elena and Savoia. Sheer glaciers full of clefts and fissures have first to be overcome to reach the actual summits. This would be a far from ideal route should the weather turn bad. We decide to see if it is possible to go up direct from the Stanley Plateau. We return to it, cross



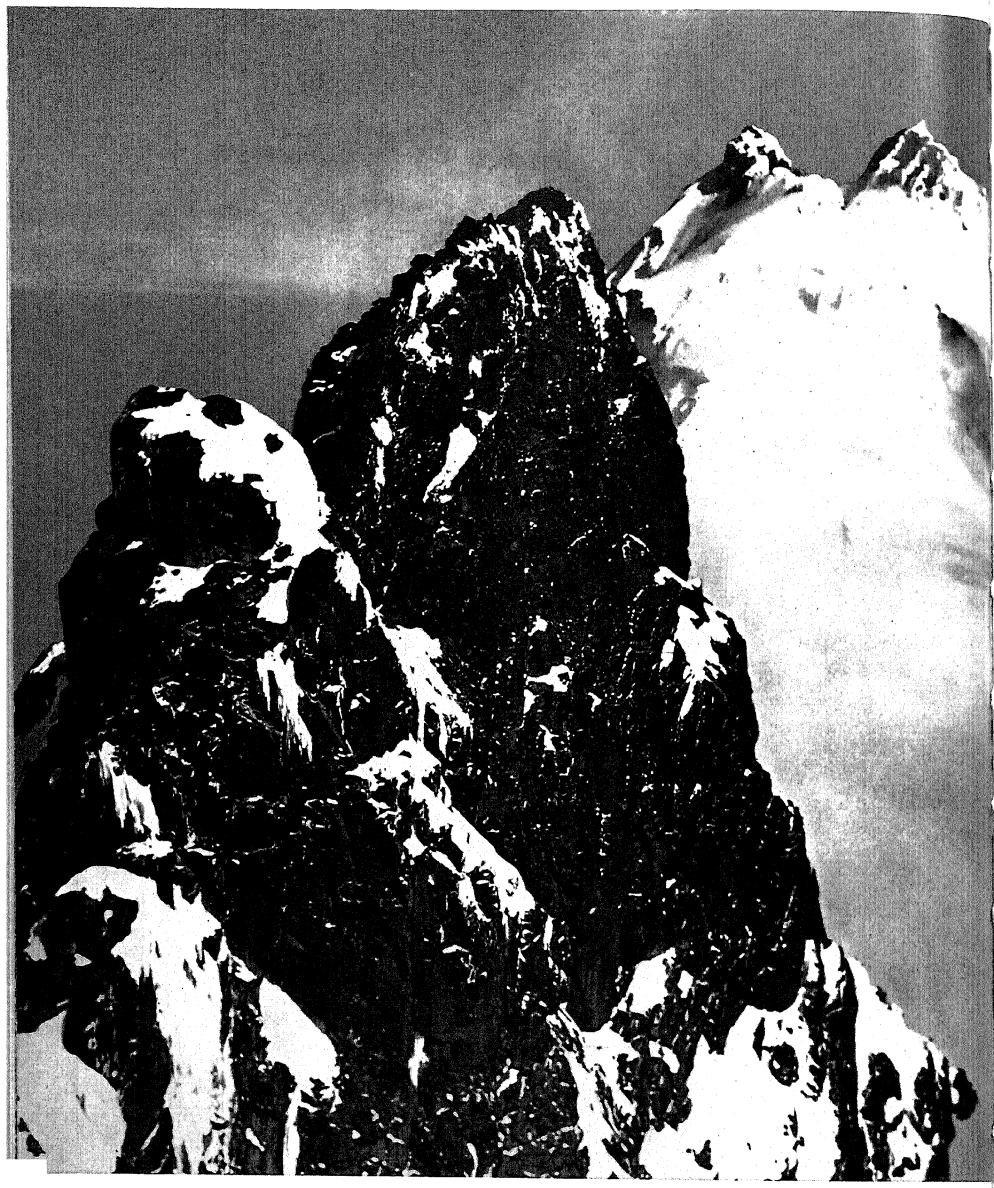
42 ALEXANDRA (16,700 ft.) from the north, Ruwenzori, East Africa. (Photograph by Dölf Reist)



43 LUSH TROPICAL VEGETATION on the banks of Lake Bujuku, Ruwenzori, at nearly 13,000 ft. (Photograph by Dölf Reist)



44 WORLD OF ICE AND SNOW in the Tropics, in almost incredible contrast to the flowering vegetation in the preceding picture (ascent to the Stanley Plateau, Ruwenzori). (Photograph by Dölf Reist)



45 THE SUMMITS OF THE STANLEY RANGE: Great Tooth, Elena, Alexandra
(16,700 ft.) and Margherita (18,770 ft.). (Photograph by Dölf Reist)

Möbius and then climb up an almost perpendicular snow gully on the Elena to a first terrace. We surmount the overhang that follows by one standing on the other's shoulders. Keeping to the right, we cross over a couloir and now clamber on the west flank to the summit (16,350 feet) over steep slabs covered with slippery moss. Clouds swirl all round us and it is cold, so we go on at once and descend along the south ridge. A 100-foot descent by rope brings us into the fissure north of the Great Tooth. It cannot be an easy mountain to climb, but we are not going to attempt it today and cross the Congo flank to the next fissure from which a very steep couloir drops away through the east flank. Because of a huge cornice blocking the way down, we have to use the rope. The wooden pegs stowed away in our rucksacks are just what is needed. Driven into the crusted snow, they make good stays for the double rope. I grope my way over the edge of the cornice. Big lumps of snow break away beneath my feet and I fall—to swing a moment later beneath the roof of snow, hardly able to breathe. Long, crooked arms reach out to me, arms of snow and rime growing out of the roof in dozens. A fascinating sight! These shapes are again natural works of art caused by storms and mist. As I slide on I have only one hope—that the cornice will not collapse on top of me.

This key position gives us a lot more trouble in the days that follow, for we pass it several times as we ascend and descend. When climbing up we use the double rope left hanging there and the Jümar stirrup. This saves us the long detour over the Elena when approaching the most southerly group.

During the next twelve days we are continually on the move, sometimes in sunshine but generally in mist and falling snow. Determinedly we climb every summit two, three or even four times. At last the film is completed. Afterwards the storm rages over the Stanley Group once more; lightning flashes and hail beats a tattoo on the metal roof for nights on end. Black swathes of fog scurry over the Scott-Elliott Pass. The bad weather assails us from all sides; there is no fine-weather wind on Ruwenzori. Cold and damp penetrate all our clothing, so we mostly lie in our warm sleeping bags. The days go by slowly and monotonously and the changeover of porters every two days provides a welcome diversion. Their curly hair and black skins remind us that, cold as it may be, we are in the heart of Africa! Despite the snow, they turn up in gym shoes and shorts. They are conscientious fellows and we gladly reward them with hot tea and an extra cigarette.

Fine weather returns at last on January 27. The mountains sparkle in their wintry raiment, their flanks covered in snow and ice. We climb through the big

gully towards the Savoia. Surmounting the cornice is a difficult job, in spite of the rope attached there. Under these conditions a direct climb from this point on the Savoia is out of the question, which means we have to make a detour on the Congo flank. We therefore descend about 600 feet and cross on the broad shoulder of a ridge. The views down to Lakes Gris, Vert and Noir and towards Mutwange are indescribably beautiful. We reach the summit of the Elizabeth (16,203 feet) via steep snow slopes. This peak, and its neighbour, Philip (16,039 feet) were named in 1953. It was conquered for the first time only a few years ago by a party from Kitandra who went up by its south-eastern flank.

A few days previously we had attempted an ascent from the north. The deep couloir traversing the north face is exceptionally steep, an ice bastion partially overhanging it. After we had secured the pitons firmly in the side rock, Felix cleared away the rotten porous ice on this overhang. There must have been several cubic yards of it. Then he laboriously hacked out steps and hand holds. Above this difficult spot we at once prepared a rope anchorage. After long searching and testing we finally found a suitable block around which, after removing the sharp edges, we tied a rope sling. Together we gave the whole anchorage one more test—one, two, heave! And the whole block disappeared into the depths—it was only frozen on to the face! With the aid of a wooden wedge we then inserted a hook. After a short rest on the summit we went down by rope.

Today I am on the southern flank of the Elizabeth, filming Mr. Graham and Felix making the ascent and descent. The two are soon back and together we cross the Elizabeth and the Savoia (16,420 feet). We already know the route down from here and soon come across the wooden peg we drove in, now covered with new snow. We descend by rope into the greatly corniced fissure. We move quickly now because of the weather, for we still want to climb our last peak, the Great Tooth. Hurriedly we traverse to the gap. A rising whirlwind drives a thundercloud towards us and we have climbed hardly 50 feet before the first raindrops begin to splash on to the rocks. The rain soon changes to hail and now the thunderstorm breaks in all its intensity. The whole mountain seems to come alive and the white hailstones pour down our ascent gully in torrents. But Felix keeps going, for tomorrow we want to pack up and return to Bujuku! He stands on my shoulders in order to surmount the overhang, and while the rope slips slowly through my hands, the storm howls and roars over the summit.

And so ends our last adventure on Ruwenzori. Next day we descend from the icy heights into the clammy, warm, equatorial zone.

SWISS ALPINE CLUB ANDEAN EXPEDITION 1959

By Ruedi Schatz

What made us go to that faraway region in the heart of the Andes? Simply pleasure! Because we were all still immature and boyish enough to find enjoyment in risk, in danger and in novelty; in sweating and gasping, in camping beneath the starlit night of the Andes, in the simple life, and especially in freedom. And is not freedom what a mountaineer seeks above all? We all of us pass our lives in the well-ordered motherland, sheltered by State and family, fitting somewhere into the structure of society, and we know that such a state of affairs probably must exist when many people live together. Yet we dream of going away now and then with a few other people, where laws and customs and rank are not enough, where only the simplest human values hold good: honesty, loyalty, helpfulness, frankness; where only by these factors a man is truly valued. Nowhere does this show as clearly as on a mountain tour.

An expedition team is no bunch of heroes, setting out to risk their lives, but a group of people seeking a new experience and, in doing so, depending most intimately upon each other; they know that nothing involves so many obligations as freedom, and therefore try to deal with their own little weaknesses out of consideration for the rest. It may be more important that Hans helps Heiri to put up the tent, even if he himself is tired, than that he attempts to climb a pitch of the sixth degree without hesitation. The true values of an expedition group lie far away from conventional heroism.

For the last few years we had been dreaming while one of us was laying bricks, another making locks, a third studying, a fourth working in an aircraft hangar. Those who were 24 and those who were 42 years of age shared the same dream: of seeing strange countries, of catching the odour of strange villages and hearing the sound of strange languages, of looking up to strange peaks, crossing snow and ice that nobody before us had trodden, and of being free in the best sense of the word. If one dreams but long enough, the dream may become real.

And so it did. At first we dreamed less and less of strange countries in general, but more particularly of Peru. There, under the equatorial sun, lie shining peaks

without number. They are not as high as the giants of the Himalaya, but even 6000 m. means quite a lot, and in boldness of shape, in their adventurous ice-formations and in the difficulties of ice and névé, they are almost unequalled. In Peru there are the remains of an ancient culture, too, mighty blocks of rock hewn to fit one another perfectly in the unshaded sunlight; colourful Indios and their llamas wander over the infinitely wide high plains; powerful rivers break through wild jungle-gorges from the mountains into the jungle-filled Amazon basin. Though many of the most tempting summits had already been climbed, the advice of our English friends, centred upon Simon Clark, of our Swiss expert on Peru, Marcus Brönnimann, of Prof. Kinzl, Erwin Schneider and Günther Hauser, our German and Austrian comrades, and suggestions from Lionel Terray all placed a tempting goal before us.

Between the gigantic chasm of the Rio Vilcanota (called the Urubamba in its lower course) and the Apurimac, the Cordillera Vilcabamba stretches for about 60 miles. It is divided into three groups. The easternmost group is dominated by Salcantay (c. 6100 m.), the highest peak of the region, a lonely summit against which its immediate neighbours can hardly compete. About 30 miles further west rises the second, completely different massif, a series of summits of more or less equal height, arranged in ridges, comparable with the front between Jungfrau and Breithorn, separated only by insignificant ridge depressions, and culminating in the Pumasillo, 6070 m. high, to which the group owes its name. Further west, already near the bend of the Apurimac Gorge, stands the Panta Group, somewhat lower than those just mentioned, but thanks to the rugged country and the deep valleys, with similar differences in elevation and equally bold forms.

Of these three massifs Salcantay lies nearest to Cuzco, within reach of modern means of transport; for this reason it was climbed first and has been ascended since. The way to Pumasillo is longer; the Americans and Band, one of the British Everest party, had attempted it in vain, but the previous year an English expedition from Cambridge had found the approach after a search lasting a fortnight. All its almost equally high neighbours, however, remained untouched.

The Panta Group, furthest from Cuzco, had already been crossed by aeroplane and had also been seen from Pumasillo; but no mountaineer had as yet set foot in its valleys, to say nothing of its peaks.

So we set ourselves two objectives: firstly, to explore the Panta Group and ascend its finest peaks, then to attempt the virgin peaks in the Pumasillo region. Our English friends assisted us with advice and in a practical manner, although they themselves had intended to go to the same area a year later.

We had a goal but nothing else. At first, we had to acknowledge the truth of the saying that everything depends on gold, even an enterprise as useless as ours, which could not be weighed in terms of money. And once we had the money, the equipment had to be procured, the organization arranged, and, last not least, the team assembled.

First, the team. Here, above all, I wanted to make a dream come true—to set out with my best and dearest mountain comrades. For years we young East-Swiss climbers had joined forces in the Kletterclub Alpstein; we knew each other from innumerable tours together, and we knew that, not only would we get on well together, but we would be happy and gay. To make my wish come true the nucleus of the expedition had to come from that club, and as to persons, I wanted a mixed expedition. I have already said that in such an enterprise everyone shows himself only as a human being, devoid of all barriers of rank, yet everyone brings his own special intellectual and manual capacities. It seemed important to me to assemble the team in such a way that each could make use of his special capacities in the common weal. A group composed only of university men seemed not only to offer more possibilities of friction, but they would probably be far more helpless if faced with practical problems, from repairing a gas cooker to loading a mule. Furthermore, neither common sense, nor humour and self-discipline depend upon education; on the contrary, there are found in an encouraging degree everywhere amongst us mountaineers. I also wanted a variety of ages: what a young person brings along in pugnacity is balanced by what an older man brings in perseverance and experience. Finally, young climbing acrobats were to join forces with experienced high tourists and ice-men.

The S.A.C.—which supported our expedition—as a club comprising the whole of Switzerland, wanted Western Switzerland to be represented too. So in the end, from the Kletterclub Alpstein came the young dare-devil climbers Sepp Abderhalden and Franz Anderrüthi, the experienced mountain guides Erich Haltiner and Geny Steiger, and that old fox, Hans Frommenwiller, a man of golden humour; from the Bernese Oberland we were joined by my old friend Ernst Reiss, who has climbed Lhotse; and in Geneva we found three fine comrades in Jean-Jacques Asper, an Everest veteran, Marcel Bron and Roger Habersaat, all three belonging to the elite of the Androsace Club. Dr. Hans Thoenen combined in one person a conscientious doctor and a mountaineer of endurance.

The scientific party was selected by Prof. E. Imhof of the Federal Technical High School, who organized the scientific programme; and in Peter Fricker,

geologist, Ernst Spiess, topographer, and Charles Terrier, botanist, we found three members who not only opened up for us new insights into nature, but who also fitted in splendidly with the climbing team, who at first were strangers to them.

This large team, with its scientific party, shows that we were not just a group of adventurous mountain vagabonds, but that we were backed by a strong organization. Indeed, our dreams had only just emerged into reality when the Swiss Alpine Club took over our plans and decided, for the first time in the hundred years of its history, to send an expedition out in its own name. Thus our enterprise was made secure. The advice and help of the Central Committee, the great reputation of the club and its resources, guaranteed a solution of the financial problem and induced numerous firms to provide equipment cheaply or even for nothing. Moreover, loyal to its tradition of fostering climbing not only as a sport but also for the scientific exploration of the Alpine regions, it was the S.A.C. which suggested that we take along a scientific party.

Little need be said about the equipment. Today, most articles have been fully tried out. We took down jackets, but no down trousers or gloves. We wore normal, well-cut climbing boots of a silicon-tanned leather, making sure of necessary warmth by well-fitting down socks. We used butagas and petrol cookers. As to provisions, it should be noted that in the Andes one spends less time in high camps than in the Himalayas and therefore can live largely on a normal mixed diet. The packing of the food in units proved very practical, i. e. cases of 15-20 kg., containing sufficient food to keep three men for three days. In general, well-considered packing saves much time and annoyance, and this work was excellently done for us by the Swiss Foundation for Alpine Research.

On April 15th, at midnight, the *Conte Biancamano* cast off from the pier at Genoa, and the morning found us off Cannes. Now began that blissfully lazy alternation of day and night, dining room and deck chair, swimming pool and shuffle board, which distinguishes a sea voyage in southerly latitudes. One recovers one's peace of mind after the rush of last-minute preparations; one acquires reserves as one battles one's way through the plentiful shipboard menu; and, not the least important point, men get to know one another better. Each afternoon we interrupted the daily routine for an hour in order to discuss questions of organization, to study the equipment lists, and to learn something about the history and customs of Peru and the technique of mountaineering in the Andes. We dined, slept, bathed, and talked our way to Rio de Janeiro, richer by an experience which no aeroplane can ever provide.

One glance at the colourful city on the widely curved ocean bay, at the foot of bold mountain scenery, imbedded between the green primeval forest and the blue sea; then we flew over the infinite stretches of the South American jungle towards the Andes and across to the Pacific and Lima.

The usual battle with the customs authorities kept to bearable limits, thanks to the efforts of the Swiss Ambassador. Yet ten days passed before our two lorries rattled out of Lima on their journey through the ditches and holes of the Peruvian country roads, past wild gorges and the remains of cars, with many crosses by the roadside. This drive of about 1000 km. to Mollepatha lasted for three and a half days, by day and night. Immediately beyond Lima the road winds up to almost 5000 m., where one reaches the Peruvian high plateau which extends for hundreds of miles between the Eastern Cordillera and the steep Pacific escarpment, a brown waste, interrupted by vegetation only along the river courses. Here lives the Indio of the Alto Plano in his colourful poncho; here lives the llama, too, and here the Andean night falls coldly and abruptly upon the land. Here and there an extinct volcano rises from the wide plain, in the southerly part of the country often to more than 6000 m., but the relative differences in height remain slight and the mountains are not very impressive or very interesting from a mountaineering viewpoint. Only at the eastern edge of the highlands rises once more a mighty folded range, furrowed by rapid rivers rushing towards the Amazon, with bold peaks that appear as tempting goals for the climber.

In the valley of the Apurímac, on a terrace filled with trees and fertile acres, lies Mollepatha, the starting point of our approach march. About sixty mules took our equipment on their backs, the scientific instruments making up a considerable part of the load.

The march began, and the first drops of sweat ran down. The mules set a tremendous pace, and we old sea-dogs, without any acclimatisation, were very hard pressed to follow them to the first pass, 4600 m. high. As the days went by we managed better, our mules providing a good scale for our growing acclimatisation. Our way led first over the Puerto Salcantay, at the foot of that mighty peak, which, veiled in clouds, hurled new snow down at us and blocked the pass for a day. Then we descended into jungle-filled valleys in streaming rain, and out of the forest girdle again over a new pass to Yanama, the village at the base of Pumasillo.

Here we split up. A group of fourteen men was not only too cumbersome, but it was also scarcely likely to find sufficient mountaineering goals in a single area. I therefore decided to form two groups: the first group of five climbers

was to establish a Base Camp in the valley of Paccha, at the western foot of Pumasillo, and to climb that mountain a second time and as many of its neighbours as possible for the first time. The leadership of this group I entrusted to Ernst Reiss; the other members were the guide Erich Haltiner, Dr. Thoenen and the two climbers Abderhalden and Anderrüthi.

The remainder was to push on into the unknown Panta region. In that untouched massif the scientists would probably find the most rewarding field for their work, and the climbers, without knowing anything definite about it, hoped to find some beautiful summits.

First, let us record the activities of the Pumasillo group. The inhabitants of Yanama, having slept themselves sober after an important religious festival, regained their ability to load the mules, so that the Base Camp at the foot of the Pumasillo could be established on May 26th. There our tents stood on a glacier tongue in a narrow valley trough, at a height of about 4500 m., surrounded by a wild amphitheatre of mountains, from the ridges of which the finely fluted flanks of snow fell with breath-taking steepness.

The corner buttress of the range is Sacsarayoc, from which the ridge swings over to Cabeza Blanca and then up to Pumasillo and further away to the Mitri. The ridge then turns westwards, closes the valley and continues southward via the gloriously beautiful and bold Nevado Choquetacarpo (called "Nice Peak" by the English) to the wild peaks above Paccha.

We had subscribed to the "light and quick" tactics. The mountaineer, after all, prefers to act so that the risks of an ascent are reduced to a minimum. He can do this by equipping himself for all eventualities, thereby loading himself heavily, by establishing a series of high camps, and by preparing difficult pitches; in this way, safety is purchased by slowness and is itself diminished, since one is exposed to the risks for a longer period. The alternative is to restrict equipment on the mountain to a necessary minimum, but one can thus be quicker and considerably shorten the time one is exposed to objective dangers like changes in the weather or avalanches. We choose the second method.

After only two days' stay at Base Camp Pucapuca was climbed, where our comrades at once became acquainted with the chief dangers in the Andes: the gigantic cornice formations, the extremely bad ice, and the deep and steep powder-snow flanks of the southern slopes. In the Andes the snow clings to gradients on which, in the Alps, only bare rock is encountered, and the ice balconies cling to small terraces from which at home they would have thundered down much sooner. Here one finds fantastic ice formations that overhang a

long way, and even if they stay up for an incredibly long time, they crash down eventually. The summit of Pucapuca was guarded by just such a collar of overhanging ice, which was most difficult to overcome.

After another two peaks had been climbed Pumasillo itself was attempted. Although it had been climbed once before, yet by the irony of figures it was not only slightly higher than its neighbours but also the only peak which crossed the ominous six-thousand metre limit. Though we got to know, during this expedition, the doubtful nature of "metre-mountaineering", since a good six-thousander may well offer fewer difficulties than a "five-and-a-half", who could blame us for wanting to climb the highest peak of the massif, especially one with the bold shape of Pumasillo? We quickly saw that on the whole the English route offered the only reasonable chance of ascent. We knew, too, that it took them two weeks of stubborn fighting to reach the summit, which had involved three high camps. We established one camp very low down, at only 5100 m., and the same day prepared the ensuing very difficult pitch in the steepest ice. The Haltiner-Reiss rope reached the summit the very next day, and they were deeply impressed by the gigantic cornices, by the ethereal summit cap, and by the steep fluted ice of the lower parts of the ridge. It was dark when, very tired, these two men arrived back in camp. The ascent was repeated the following day by Abderhalden and Anderrüthi.

After a short pause for recovery, the whole group climbed Nevado Choquetacampo, the Matterhorn of this region, which George Band had vainly tried to climb from the south. There followed an ascent of Cabeza Blanca, close to the six-thousand line, and just as they were preparing to move the Base Camp to the foot of Sacsarayoc, I gave them radioinstructions not to waste another fortnight on this mountain but to join the second group at Cuzco. This decision was essential because the Panta group had climbed all the interesting peaks in their region and I wanted to avoid dividing the expedition into two distinct groups for the whole duration of our undertaking. We were one team and one community, and if quick results enabled us to work with two climbing groups, then the groups should be rearranged for the second phase. With eight peaks in their bag the Pumasillo group retraced its steps to Cuzco, and there met up with us on June 23rd.

We must now go back to recount the activities of the Panta group. At Yanama the main part of the expedition entered the tremendously rugged river area of the Apurímac: a land ploughed by a thousand gorges, a chaos of valleys and ramified ridges, carved out by the water in its brief plunge from the heights

of the Andes into the depths of the Amazon basin. Our route was like a maze. It ran down into gorges with the lushest vegetation, then by an ancient Inca path over the snowed-up Choquetacarpo Pass (4500 m.) into the wide and lovely valley of Vilcabamba, and over new passes across to Lake Soiroccocha, where we arrived at length after a march lasting ten days, and after innumerable discussions with our mule drivers, alternately appealing and violent.

We had now accomplished an approach march of Himalayan scale; Nepalese porters would have taken at least a fortnight for the same distance. But it was not yet at an end. An advance group had left Mollepata five days before us, with the task of finding the most favourable site for a Base Camp in the unknown Panta region. But continuous fog had made any survey impossible and the group was unable to accomplish its task. The day after our arrival at the provisional camp site the weather opened up and we realised that a further day's march lay before us. Thus it was July 2nd before we finally pitched camp, right at the foot of Camballa, and the very next day, in brilliant sunshine, the great selection of climbing possibilities in this region was revealed to us.

The Panta region has a character completely different from that of the Pumasillo massif. There one finds a connected mass of high mountains within a small area; here, mighty and independent peaks rose up alone and rather far from one another. The most beautiful of these summits stood directly above our camp: Camballa, a bold peak of black rock with incredibly pinnacled ridges, with snow and ice balconies of improbable boldness, the summit itself as slender as a needle. We realised at once that this was the most beautiful and most difficult objective in the area. However, far to the south stood the highest mountain, Panta itself, some 5840 m. high, a mighty block with an endless east ridge, a steep west escarpment and an imposing north face. And between the two lay the beautiful massif of Soiroccocha, the triple peak of the Kuima (triplets). The Panta Group is the westernmost corner buttress of the Eastern Cordillera; it drops straight down into the wilderness of the Apurímac gorge.

After a full day's work a first trip brought us the summit of Soiroccocha. Then we attempted Camballa. The route to a high camp was made safe with ropes, and the camp itself was pushed forward. After seven hours' work our comrades from Western Switzerland managed the 300 m. which separated them from the summit; the following day it was our turn.

The high camp gave us a real foretaste of the tour: a dreamlike and beautiful spot on a small saddle surrounded by gigantic cornices, by ice caves in which there was room enough to house several families, and a view up the flank to the

summit, which made one hesitate to leave the tent. This flank had to be traversed first of all; above it the balconies of ice were piled up in wild chaos, crashing down now and then, and leaving deep tracks in the névé. We made the traverse hurriedly at dawn and then stood at the foot of a steep rock rib, which had been left bare by the ice and pointed the only possible way to the top. The rock was good, and for safety one could frequently crawl into ice-roofed caves, curtained off by icicles, through which one looked out far into the hazy distance of the Amazon basin. Where the rock was finally submerged by the ice, a vertical ice-bulge had to be overcome, then a small gully, and at last we stood at the foot of the fantastic summit structure. As if laid down upon the mountain, there was a "cream slice" of porous ice, running up obliquely and overhanging on all sides. The side walls of this slice had to be climbed along the porous ice; then the oblique upper side had to be reached, and above it stood the last 80 m. at a gradient of over 60°. An ice-axe was swallowed by the ice as if in a pudding; the surface splintered where one trod, and there was no question of driving in pitons. On the tiny summit ridge, we could sit only one at a time with the handles of our ice-axes penetrating the névé into emptiness beneath. Small wonder that we were not happy till we had left this uncomfortable spot. A few roping-down manœuvres, and another traverse of the flank in the sodden afternoon snow, brought us back to the high camp and the same day to Base Camp.

It is a tremendous psychological advantage to have accomplished the hardest task at the very beginning, so we were in high spirits when we moved Base Camp in another day to the northern foot of Panta, a truly ideal spot, where we could cook below a huge overhanging rock and little streams rushed gaily past our camp on either side. Before us stood the northern flank of Panta, a wide wall of rock ribs and torn ice streams. The natural route seemed to lead over the east ridge. Once the ridge was gained the way on could no longer be technically difficult, but it would be endless and, from a mountaineering viewpoint, very satisfying. We therefore decided to attempt the mountain by the north face, in direct vertical line to the summit. High camp was pitched at about 5100 m., on the saddle at the foot of the wall. This time we German-Swiss took precedence. A rock bulwark, easily 200 m. high, took us by not too difficult climbing to the beginning of the ice-flank, to which we clung for the next few hours like flies on a window-pane. Rope-length by rope-length we worked our way up in a steep ice-channel, always in the fall-line of an overhanging ice-tower, for the durability of which we put up many a short prayer. Geny Steiger cut innumerable

steps, while here and there a tiny crack in the ice-structure provided a natural opportunity for securing the party. It was after 3 p.m. when we reached the summit of the highest mountain in our area and shook hands happily. The sun goes down quickly in the tropics; by 6 p.m. darkness falls, and the sky took on the gold of evening while we were still descending the middle of the face. The pocket torches of our comrades, who reached the summit very quickly the following day, showed us the way through the rocks; then we stumbled in the darkness over the moraines to the Base Camp.

When we had climbed the five remaining important peaks of the region, the moment to say farewell to our scientific comrades came. They had by no means finished their work; the botanist and the geologist wanted to go down into the Apurímac gorges to continue their explorations, and the topographer had still to take many measurements before he could leave with a clear conscience. But we wanted to use our few remaining weeks for visiting still other peaks and other regions of this wide country.

So we set out through the Vilcabamba Valley, in a journey of only four days from the foot of Panta to the only road in this district leading into the Montaña, the hilly jungle region at the base of the Andes. Often we swayed for eight hours in the saddle, feeling that though our lungs had got used to the altitude, our natural sitting equipment was by no means used to riding. Like sailors of old, we climbed bandy-legged into the train at Huadquina, which, in the most intimate association with fried guinea-pigs, nursing mothers, crying babies, living dogs and spitting Indios, brought us in eight hours to Cuzco, the ancient capital of the Inca empire, where the following day the *Inti Raymi* (feast of the sun-god), the most important feast of this long-vanished state, was to be revived. There we met our comrades; we had been in touch with them by radio twice a week, but it was a great pleasure to see them again, all well and happy.

The great feast of the sun-god took place on the gigantic stones of the ancient Inca fortress of *Sacsahuamán*, above Cuzco. From far and wide the Indios had come, and by noon some 30,000 people filled the huge space around the festival site. There they sat in their colourful ponchos, their fantastic hats, the women carrying their children in shoulder-cloths; they glanced at a spectacle which four hundred years ago had been their nation's most important festival. Most of these watching eyes had the feverish brightness of the addicted coca-eater; the faces had the emaciated sallowness of the alcoholic. They came from their earth huts and rested on the heavy stone masonry which their ancestors had fitted together most perfectly.

One could not but reflect upon the unbelievably rapid decay of the soul of a once great nation. Here, men of this same race had founded the largest empire in America, with many millions of inhabitants; they had built cities and constructed roads far and wide across the mountains and had governed a centrally organized empire. To-day nothing remains of all this, absolutely nothing. No word characterizes these Indios better than this "nothing". They live, yes, but their will to live is weak, manifesting itself only in acquiring what is most necessary: a few potatoes, shelter from the rain, and an inadequate hut as protection against the upland cold, satisfy their demands. They take refuge in dreams, in an alcoholized, coca-stimulated happier being. An apathy lies over this nation, an infinite melancholy, echoed in the dances and songs to the Peruvian harp and flute which were intoned in the circular festival site. A nation whose soul had been stolen, a nation which had already been kept in utter subjugation in the dictatorial Inca state. But it does seem that the loss of their own statehood and the destruction of their ancient culture was the beginning of a decline without parallel.

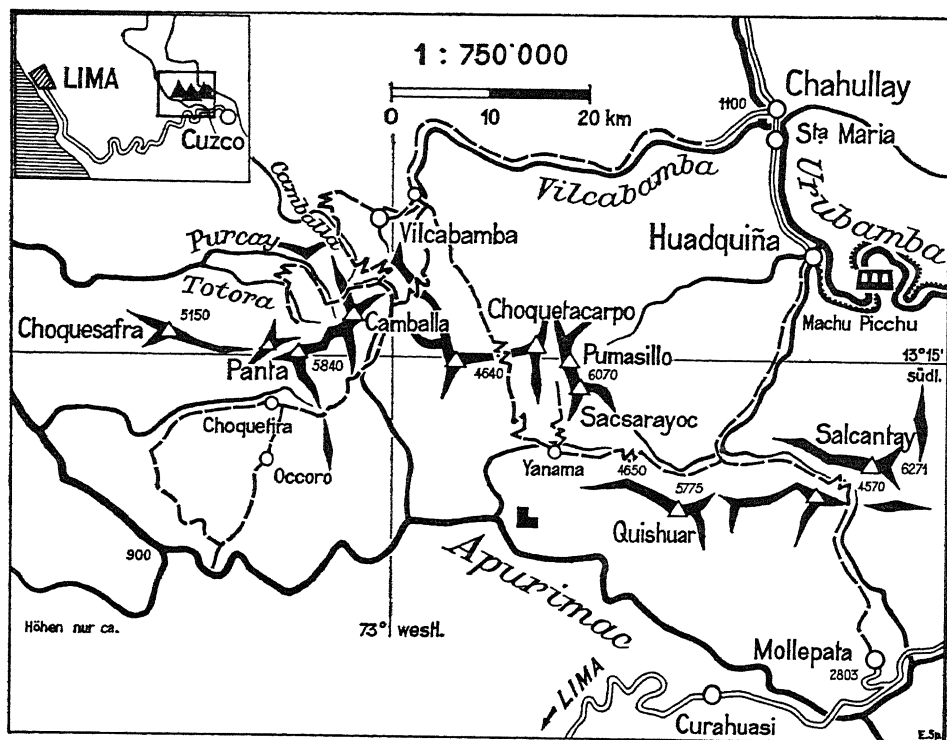
But there are exceptions amongst the Indios; the population of the Santa Valley, for instance, makes a very good impression. It seems that the inhabitants of this old and independent cultural region further from Cuzco, the state's centre, have been able to preserve a freer, prouder type of man. And many half-breeds, too, were certainly impressive personalities.

Thus, if anything, this festival of remembrance of a faded splendour made one sad. High clouds sailed across the brown expanse of the highlands when the festival procession of the Inca, the ruler, descended from the hill, and one realised with shame that not even the most modest implement was genuine: the conquerors had done their work thoroughly and where only a fragment of gold was to be found the Spanish fist had grabbed it.

We still had roughly three weeks at our disposal when we sat together at Cuzco and discussed our future plans. Outside, the rain splashed against the hotel windows, the snow came down almost to the town (3300 m.), and the passes to the mountains were undoubtedly all blocked. What were we to do? The chief objective of the expedition had been attained; fifteen summits had been climbed, and the unknown Panta region had been explored. Surely, we could now follow our inclinations. The Cordillera Vilcabamba, furthest east, whence the rains came, is known for weather of quite un-Peruvian changeability. There the southern winter from May to the end of September, when there is hardly a drop of rain on the Alto Plano or in Lima, is unknown. Those who first ascended

Salcantay, for instance, had had four weeks of continuous snow-falls, and even the approach march, which is normally covered in three days, took them a fortnight. Although in the Veronica group there were still some tempting goals (Saguasiray above all), to move into a Base Camp during the prevailing wretched weather conditions, and in which we would be able to stay a fortnight at the most, and to wait there, perhaps in vain, for fine weather, was not what we wanted. We therefore decided to go north, into the Cordillera Blanca. We knew that there would hardly be enough time for a great undertaking or for many summits. But we also knew that there, only a day's journey from Lima, lay the most beautiful mountain range in South America, perhaps in the whole world, and that there we could be sure of finding sunshine.

So we said good-bye to our countryman and protector, Erwin Dorer, and drove in one day up to Huaraz in the Santa Valley, at the foot of the Cordillera.



Cordillera Vilcabamba, Peru. (Sketch by Ernst Spiess.)

It was still far more beautiful than we had imagined in our dreams. When our trucks rolled over the pass, where lay the Goñococha Lake, a country of fairytale-like beauty opened up before our eyes. The Santa Valley runs from south to north, a wide and friendly depression, filled with clean villages and townlets, palms and bushy hedges; the slopes are dotted with the gold of small cornfields, and the people are friendly and smiling. And above this runs a silvery-white ribbon of mountain forms, each according the other sufficient space for unrestricted display, some of them unbelievably bold, others mightily restful, and all covered with such an immaculate whiteness that even in the evening twilight the eye is still blinded. We felt at home there, happy, as one is happy where air and scent, where the people's laughter, where the shapes of the landscape all correspond inexpressibly to one's inner feelings and can signify home.

Of course, we were not the first to discover this splendour. Since 1930 Germans and Austrians, mainly, and after them Americans and Frenchmen, had opened up this wonderland. The highest peaks had all been climbed; what was left were a few extremely difficult peaks close to the 6000-m. limit and new routes to already climbed summits. In Peru, these days, the second phase of mountaineering has begun. There are no unclimbed isolated six-thousanders, no unknown mountain groups of any size. The time has come to attempt the most difficult peaks of the second altitude class—which Terray has already done—and to open up new routes to the great summits.

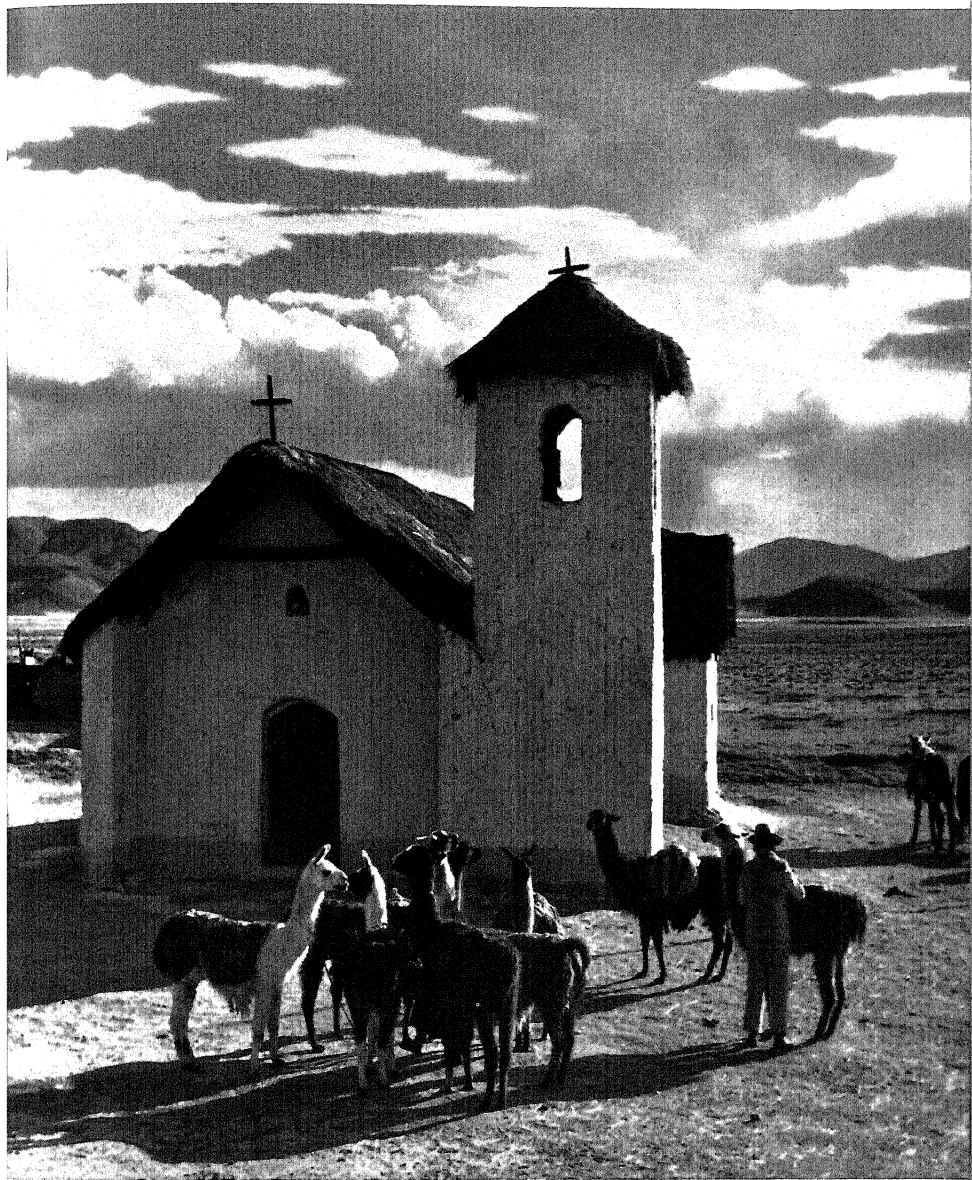
Again we separated into two groups. Our three West-Swiss comrades, augmented by Sepp Abderhalden, and looked after by Dr. Thoenen, wanted to tackle Cayesh; we others pitched our high camp by the Parrón Lake. Taking into consideration the time for the return journey, for packing and customs examination, we had about nine days in the mountains left, and every hour had to be used properly.

The deep blue Parrón Lake lay embedded between steep rock slopes above Carás, at an altitude of about 4000 m. In the background of the valley stood the glacier pyramid of Garcilaso and Chacaraju; but to get there one had to cross the lake by a selfmade raft and for this we had no time. As soon as our small donkeys had dropped their loads at the end of the lake, we built our Base Camp, and the very next day began our work or our pleasure, whichever you care to call it. To the south of our camp stood Huandoy, at 6395 m. the third-highest mountain in the Cordillera Blanca; opposite it, to the north, Aguja Nevada (5886 m.). On these two peaks our desires were fixed. Huandoy had once been

squalls, still 600 m. below the summit. What were we to do? For 600 m. of an unknown route we had to reckon at least four hours, even if there were no serious difficulties. To go to the summit meant bivouacing. But why not? We left every ounce of dispensable equipment in a crevasse where we intended to establish our bivouac. Then we set out at almost half-past one. Ernst Reiss led. We cursed him secretly; unrelentingly he put foot before foot, as quickly as he found possible. Our lungs gasped, our hearts hammered madly. "Let's sit down", everything in us cried out; but there was no sitting down. In each of us there was a voice which ordered us to go on. We climbed higher and higher; one grew apathetic, one hardly paid any attention to the others, fully pre-occupied with oneself, with the desire to give up and with that other desire to go on towards the summit. Now and then the fog tore apart for minutes, then a hasty glance at neighbouring peaks told us how high we were. We noticed that we were covering ground quickly. Then, after two hours, the steepness decreased; almost horizontally, we followed the ridge through fog and haze, still ascending slightly, until suddenly that feeling awoke, that happy pain which announced something long dreamed of and fought for. The summit! We sank into the snow, breathless. We shook hands, not in triumph, but in order to thank the other for holding out, for the experience of good comradeship he had given. We were happy, very happy.

At half-past three we left, in the silly hope of still getting down to the valley. We rushed down the slopes; our crampons gripped, and we did not think of securing ourselves: we could rely upon each other. After one hour we were at the top of the ice-barrier; then three roping-down manœuvres of 90 m. each, which were accomplished almost automatically, and quickly to the high camp; a hand-shake with our comrades, a sip of fruit-juice over our burning lips, and on we went, down the glacier that was golden in the late evening light, towards the valley. The violet shadows had almost reached us; dark green, far below, slumbered the Parrón Lake, and above it, in the last light of day, stood the shapes of the mountains. In grey twilight we reached the edge of the glacier, then we stumbled through the darkness, down the 1000 m. of moraine debris. How one can run after a happy day! At ten o'clock we crawled into the tents of Base Camp, tired and thirsty, but very glad.

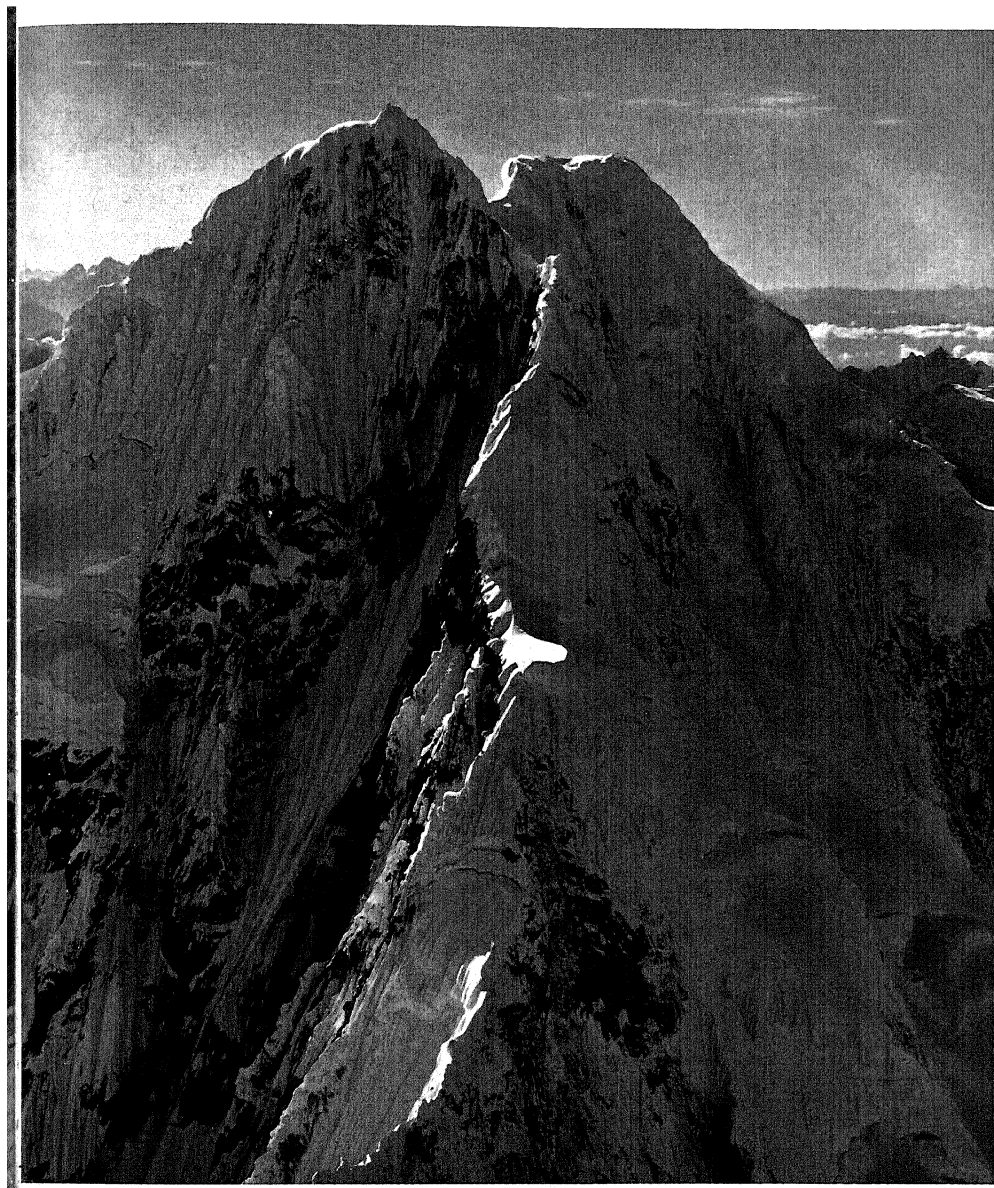
Our comrades climbed Huandoy the following day. Then I was called by my duties into the valley. Our homeland was reaching out for us, and the return journey required last preparations. Franz Anderrüthi, Ernst Reiss, and Geny Steiger climbed the virgin Aguja Nevada after I had gone. It was the most



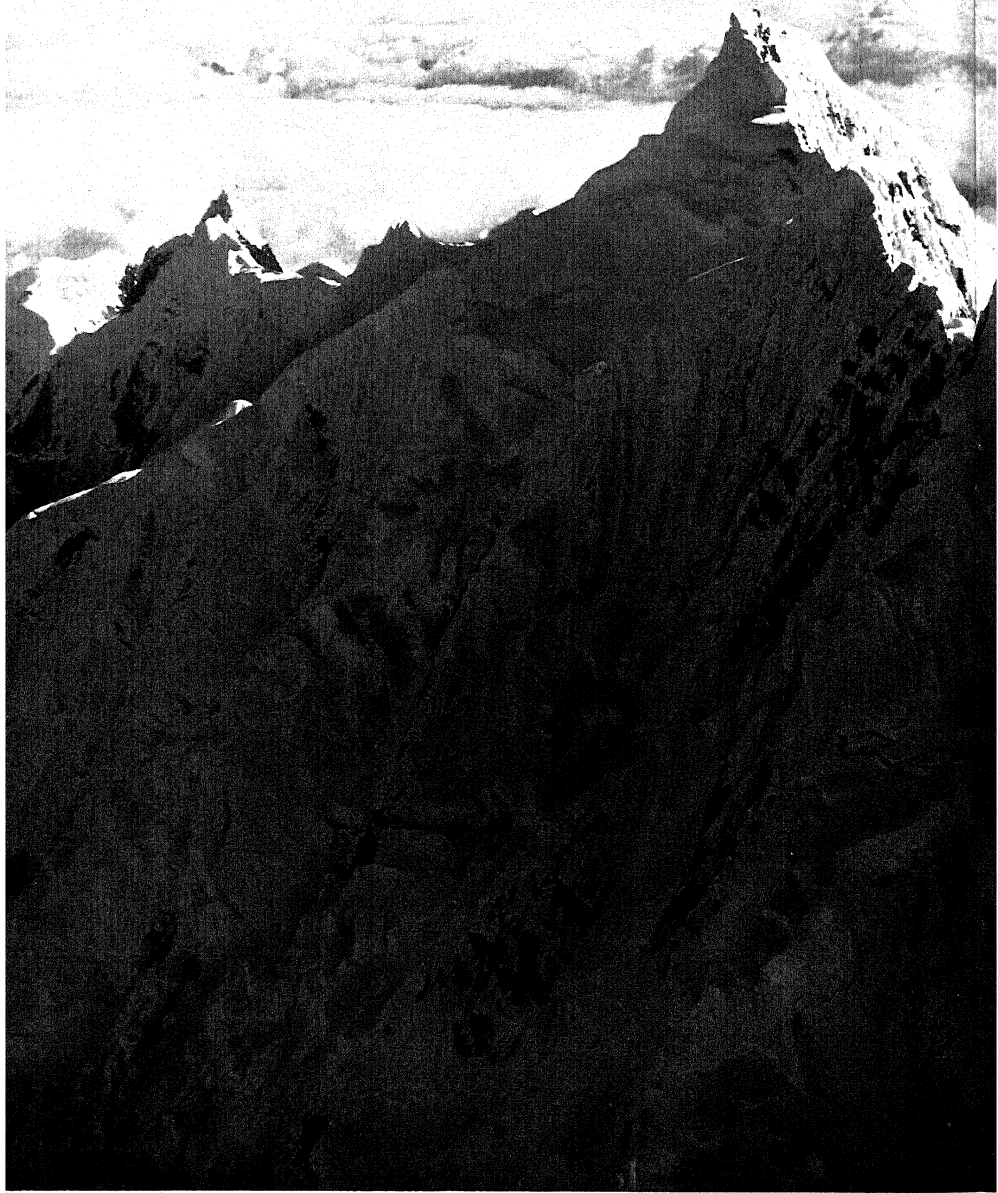
46 IN THE HIGHLANDS OF PERU. (Photograph by Cambridge Andean Expedition 1957)

47 overleaf: MULE TRAIN of the Andean expedition 1959 of the Swiss Alpine Club near Mollepata (9100 ft.) in the foothills of the Cordillera Vilcabamba, Peru. (Photograph by Andean Expedition of the SAC 1959)

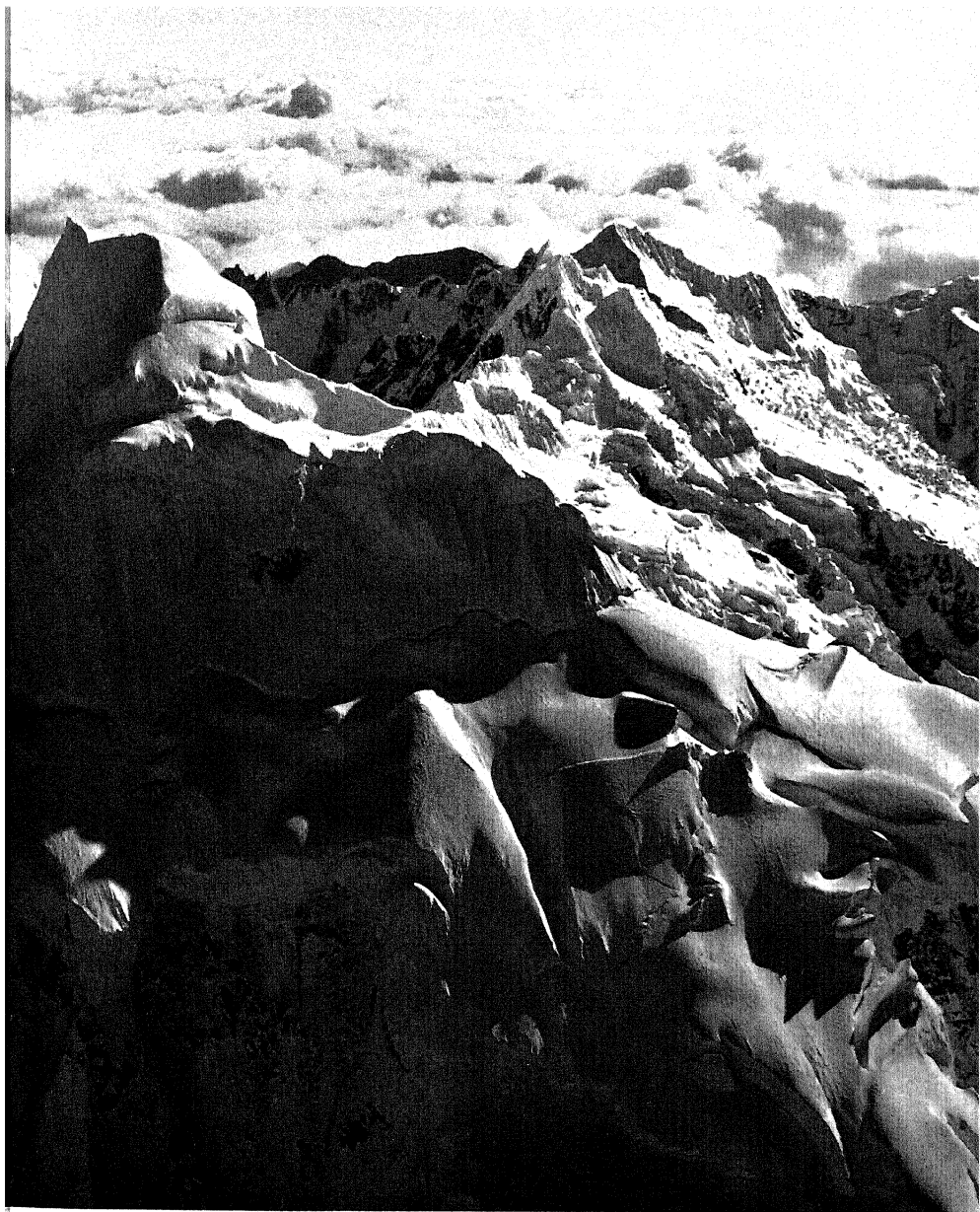




48 THE ICE SUMMIT OF PUMASILLO (19,900 ft.) in the Cordillera Vilcabamba, Peru, showing the north arête. (Photograph by Cambridge Andean Expedition 1957)



49/50 PUMASILLO FROM THE SOUTH. On the left the west ridge, with Mitre (18,800 ft.) behind it, in the foreground Sacsarayoc (approx. 19,800 ft.), Cordillera Vilcabamba. (Aerial photograph Cambridge Andean Expedition 1957)



51 overleaf: THE NAMELESS AGUJA, northernmost peak of the horseshoe overlooking the Paccha Valley, Cordillera Vilcabamba. (Photograph Cambridge Andean Expedition 1957)



tried in vain from the Parrón Lake and later climbed thrice from the south-west. Our American friends had used ten days and three high camps for this. Aguja Nevada was one of those difficult peaks in the range still untouched. We wanted to climb it and open up a new route on Huandoy through the north face. If we wanted to do both no time could be lost. We reconnoitred a high camp at the foot of the Huandoy north face at an altitude of 5400 m. The following day our four porters, with Hans Frommenwiller, Ernst Reiss and myself, carried the high camp up. It lay on a terrace of the wildly serrated glacier and before sunset we just had time to study the next day's task. The north flank began with a steep ice-slope, then it was barred by a vertical ice-barrier easily 150 m. high, and to overcome that barrier was the key to the climb. At its extremity it was split by a narrow ice-gully, bordered on the left by overhanging ice breaks, and on the right by a steep rock rib. We reckoned that hours of cutting would be involved and wanted to use the next day for making this pitch passable with steps and fixed ropes; then we would return, to let our comrades reach the summit in one day by this partly prepared route. But when in the morning we extricated ourselves, miserable and with chattering teeth, from our sleeping bags, there burned in each of us, in spite of our pitiful appearance, the desire to get to the summit the same day. This was less the product of heroism than of convenience, because the endless way from Base Camp to high camp was still in our bones, and if we did not get through to-day we would have to go down to Base Camp, for the summit party for the next day would arrive at high camp that evening. We knew, of course, that our wishful thinking was really foolish, because the idea of ascending and descending 900 m. of partly difficult terrain for the first time in one day was slightly presumptuous. Anyway, we left our camp as quickly as our feet would carry us, and after one hour had crossed the berg-schrund. The ice shot up steeply above us; blue and frosty in the shadow shone the vertical ice-barrier. The ice-axe began its endless work, our breathing grew more comfortable, the advance slower. We got stuck in the lower part of the gully and sought to gain the lowest step of the rock rib on the right, because in the gully a shelf of ice projected 20 m. over us, and the prospect of manœuvring for several hours in its fall line did not seem exactly comfortable. The traverse had been hacked into the bare ice and a rope fixed for the next day, and then the rock gave us a cold welcome. It rose steeply, and every step and hold was covered with an armour of ice. Infinitely slowly and carefully we gained height, clearing away the ice continuously, with crunching and creaking crampons, and it was 1 p. m. when we sat on top of the ice-barrier, in uncomfortable cloudy

difficult summit of our expedition. A day's hard struggle on ice that sloped at 60°, a dizzy game on overhanging cornices, and some climbing on tricky rock brought them to the summit, which stood so splendidly bold above the valley of Carás. Frommenwiller and Haltiner climbed Aguja Nevada Chica.

The Cayesh group, in the meantime, suffered a very severe ordeal. Cayesh is possibly the most difficult peak still unclimbed in Peru. An incredibly steep tower, with gigantic rock flanks, spread with ice, close to the mighty Huantsán, it has already made many an Andinist's heart beat faster. This was the first proper attempt. After an approach march of three days our comrades were left with only five days for climbing. Abderhalden, Bron and Habersaat went in; the first day brought them 300 m. of difficult rock-climbing, almost all of sixth grade. There followed a miserable night hanging in the ropes, during which the ice remains of a cornice crashed down over the route just covered. During the night Bron was seized by angina. But even without this illness they were forced to realise that the time available was too short. This mountain required a week's preparatory work. One would have to provide the lower 400 m. with fixed ropes, then interpolate a rest-day in the camp, quickly regain the accomplished altitude, and then gain the summit with one or, at the most, two bivouacs. But their time had come to an end. A tricky descent, where pitons for roping-down could be placed only after a long search, brought them back to the foot of the mountain, the only one which had rejected us. But we had reason to be content: we had climbed nineteen summits, and we had all come back safe and sound.

THE ANTARCTIC DURING THE INTERNATIONAL GEOPHYSICAL YEAR

with a Supplement on
MOUNTAINS AND FIRST MOUNTAINEERS IN ANTARCTICA

By Herfried Hoinkes

A glance into a new world

It had been days since the coast of New Zealand had sunk below the horizon and we had set sail towards the great adventure. The sea was rough, but friendlier than its reputation; it did not disturb the discussions of the numerous scientists aboard the U.S.S. *Curtiss*, who, during the International Geophysical Year, were to work in the American stations of the South Polar region. On January 17th, 1957, it grew colder rather abruptly; at about latitude 61° south we had crossed the "Antarctic Convergence" and thus entered the Antarctic.

It is not easy to define the boundaries of the polar regions; they are in any case not identical with the polar circles. In the Arctic a mostly flat country encloses a deep ocean covered with pack-ice, and vegetation, determined by the climate as the last ecological control function and growing more and more scanty with increasing latitude, makes it possible for us to draw a boundary. The northern limit of the tree tundra, coinciding roughly with the 10° C. isotherm of the warmest month, has been recognized as the boundary of the Arctic. But conditions in the South Polar region, where a high central continent is enclosed by a ring of stormy seas and where none of the continents from the temperate latitudes reaches to the polar region, are quite different. Yet in these seas there is a boundary between different masses of waters which can be directly perceived with the senses. In a strongly disturbed transitional zone the Antarctic surface water, cold and low in salt content, sinks below the warmer sub-Antarctic water. This mingling zone, called "Antarctic Convergence", is extraordinarily narrow and localized and has therefore been generally accepted as the boundary of the Antarctic. It lies in the southern part of the Atlantic and Indian oceans near a latitude of 50° , and in the Southern Pacific between latitudes of 55° and 60° . So far as is known at present, the extreme positions are 48° south as the northernmost point, near South Africa, and 62° south as the southernmost point, in the Bellingshausen Sea at 80° west. Regardless of the great difference in geographical latitude, the temperature at the Antarctic Convergence remains

almost static. In the warmest month (February) the differences are between 4.3° and 5.2° C., and in the coldest month (October) they are between 1.6° and 2.5° C., so that the annual temperature variation does not even reach to 3° C. The fact that vast, almost isothermal seas enclose the coldest part of our earth's surface is essential for an understanding of the stormy and constant westerly winds. The name "Roaring Forties" has survived from the days of the sailing ships, but it is somewhat misleading, since the strongest winds are frequently not encountered until 50° to 60° south.

The next day the first icebergs passed the ship, grey and sombre and between them the whales were spouting. The ice increased, and during the night, at the polar circle, we were joined by the ice-breaker *Glacier*, which had assumed the task of guiding us through the pack-ice girdle. White ice-floes with green broken edges rose and sank slowly in a long, smooth swell; on top of them, here and there, lay sleeping seals, and between them the first penguins demonstrated their elegant aquatic arts, while small white birds, the snow petrels, fluttered excitedly round the ship. The clouds hung low and the ice-breaker's helicopter, orange-red above the grey-blue sea, flew busily hither and thither between the ships, exchanging mail, vegetables and scientists. Suddenly the seriousness of the polar region became apparent; for the helicopter brushed the ship's side and crashed into the sea; the pilots were able to climb out in time and were already swimming far away between the ice-floes. A man cannot survive long in water of -1° C., and we hoped that there were no killer-whales about, which attack everything with their horrible teeth. The ships stopped quickly, a boat was lowered; the rescue manoeuvre was carried out methodically and precisely, and a few minutes later the victims were already on board and being thawed out in the sick bay.

From the exciting present one's thoughts wandered back to those men who had crossed the Antarctic circle for the first time. Mr. L.B. Quartermain, President of the New Zealand Antarctic Society, one of the most amiable men whom I have had the good fortune to meet, and an outstanding expert in the history of Antarctica, was a tireless story-teller. This happened on January 17th, 1773, at about longitude 40° east, during Cook's second voyage, which lasted from 1772 to 1775, and in the course of which the Antarctic Continent was circumnavigated the first time. According to a Polynesian legend, the great seafarer Hui-te-rangiora penetrated far into the Antarctic Ocean about the year 650. His reports of rocklike structures in the frozen sea leave little doubt that the Polynesians were familiar with icebergs, though we shall never know how far south they went in their canoes. On January 30th, 1774, Cook, in the *Resolution*,

reached his greatest latitude at $71^{\circ} 10'$, at a longitude of 107° west, an impressive achievement if one considers that to this day no ship has been able to penetrate further into the ice at this longitude. Although Cook had to return without having found an Antarctic Continent, he quite clearly expressed his conviction that there must be land far to the south: "...I firmly believe that there is a tract of land near the Pole, which is the source of most of the ice which is spread over this vast southern ocean..." But at first the most important result of Cook's voyage was the reduction of the large and fantastic "Terra australis incognita" of the 16th century geographers to regions essentially south of latitude 60° . All those colourful and attractive reports, given chiefly by the French travellers de Gonneville, de Brosse, and de Kerguelen-Trémarec, had to surrender to the very harsh truth. The only exploitable riches about which Cook had reported were the seals, and these were determinedly hunted down during the decades that followed by American and English seal-hunters, without any new discoveries being reported.

In the years 1819-21 the Russian sloops *Vostok* and *Mirnyj*, under Captains von Bellingshausen and Lazarev, again circumnavigated the Antarctic, at a higher latitude than Cook. Most probably Bellingshausen sighted the coast of the Antarctic Continent at longitude 2° west on January 28th, 1820, and again at longitude 16° east on February 18th, without recognizing it as such. Two islands, called Peter I Island and Alexander I Land, were all that were reported as discoveries, the first within the polar circle. Some of the seal-hunters, notably the skippers of the Enderby Brothers, added considerably to our knowledge in the ensuing years. To appreciate their achievements fully has become almost impossible to-day; one needs to have seen the Antarctic seas, if only from the deck of a strong modern ship, even to guess what intrepidity was needed to compensate for their lack of resources.

James Weddell, with the ships *Jane* (160 tons) and *Beaufoy* (65 tons), penetrated in 1822, beyond 74° south, into that part of the Antarctic Ocean which to-day bears his name, notorious because of the difficult ice conditions there. John Biscoe, with the ships *Tula* (150 tons) and *Lively* (50 tons) carried out the third circumnavigation in 1830-32 and undoubtedly discovered mountainous country at about longitude 51° east, the first of the main mass of the Antarctic continent, which he named Enderby Land after his employers. It was already late in the southern autumn, March 1831, and Biscoe reported the splendour of the polar lights, as well as the heavy gales which frustrated his attempt to land and finally separated the ships. As by a miracle, the two ships met again months later in

Tasmania, though the crew of the *Lively* had been reduced to the captain, a sailor and a cabin boy. Yet the circumnavigation was continued and Adelaide Island discovered at 69° west.

John Balleny was the first to sail due south from New Zealand, and found on February 9th, 1839, the volcanic and heavily glaciated Balleny Islands at the polar circle. A brief landing on one of the islands was carried out on February 12th, 1839. It was not until February 29th, 1948, that a second attempt was made from the Australian ship *Wyatt Earp*, which had also to be restricted to a few minutes, and a year later a third landing was successfully carried out from the French ship *Commandant Charcot*.

Probably inspired by the important discoveries of the English seal-hunters, plans were propagated in America for a national scientific Antarctic expedition. The understandable reticence of the American seal-hunters in describing their rich hunting grounds had prevented them from also being good discoverers. The preparations advanced only slowly, hindered by quarrels and rivalries, yet again spurred on by rumours about a planned British expedition to the Antarctic. In this, apart from national and commercial aspects, a specifically scientific motive came to the fore for the first time: an examination of the earth's magnetism. In 1831 James Clark Ross had found the magnetic North Pole, and Carl Friedrich Gauss, on the strength of data known at the time, had calculated the existence of a magnetic South Pole at about latitude 66° south and longitude 146° east.

Perhaps the influence of Alexander von Humboldt also had its share in the French king's commission to Dumont d'Urville to explore the Antarctic in the course of the expedition he was leading to the South Seas. This took place at the beginning of the year 1838, south of Cape Horn, with some success, but the success was all the greater when, during the search for the South Magnetic Pole, land was sighted at longitude 140° east on January 19th, 1840. Dumont d'Urville called it "Terre Adélie", after his wife, and to-day a French station stands at this site, which bears the name of this outstanding explorer. Off this new coast his ships *Astrolabe* and *Zélée* met the *Porpoise* of Wilkes' American expedition. The latter, after overcoming numerous adversities, had set out with bad ships and inadequate equipment, and it must probably be ascribed solely to the great determination of its leader, Lieutenant Charles Wilkes of the American Navy, that it was granted a great success. In the course of January and February 1840 the coast of the Antarctic Continent opposite Australia, between longitude 160° and 100° east, i.e. a distance of over 1250 miles, was several times sighted and charted. Even though some of the land was only ice and later could not be found

at the points indicated, there can be no doubt that Wilkes was the first to recognize and prove the continental dimensions of the South Polar land. Attacked after his return, Wilkes found recognition late, but to-day not only is the part of the Continent discovered by him called "Wilkes Land", but the American station standing there also bears his name.

The third large expedition—and, as was to be seen later, the most important—in these momentous years for Antarctic exploration, left England in the autumn of 1839 with a comprehensive scientific programme. It had been carefully prepared and better equipped for its tasks; the ships *Erebus* (370 tons) and *Terror* (340 tons) had been specially strengthened for their encounter with the ice, and its leader was James Clark Ross of Arctic experience. If the Americans had been surprised to find the French in their working field, Ross was equally unedified at the news which he received in Tasmania about the discoveries made a few months earlier by Dumont d'Urville and Wilkes. He expressed his surprise that the leaders of these large national expeditions should have sought out just the area which they knew very well was the explicit goal of his explorations, the region of the South Magnetic Pole. At that time the idea of international scientific co-operation obviously lay in the far distant future. In the two International Polar Years of 1882/83 and 1932/33 it made a promising start in the Arctic, until in the International Geophysical Year of 1957/58 it succeeded on a worldwide and convincing scale.

In varying his original plans, Ross at the time took the most remarkable and positive decision to explore the region adjoining the newly discovered coasts on the east. At the beginning of January 1841 his ships penetrated into the pack-ice girdle, which to their greatest surprise they successfully overcame for the first time in a few days, finding open ice-free waters further south. On January 10th, 1841, land was sighted to the west, there where the South Magnetic Pole was supposed to be. The description which Ross gave of this land cannot be improved upon: "It was a beautifully clear evening, and we had a most enchanting view of the magnificent ranges of mountains, whose lofty peaks, perfectly covered with eternal snow, rose to elevations varying from seven to ten thousand feet above the level of the ocean. The glaciers that filled their intervening valleys, and which descended from near the mountains' summits, projected in many places several miles into the sea, and terminated in lofty perpendicular cliffs." All prominent points of the newly discovered coast were named: Cape Adare, Mount Sabine, Mount Herschel; and the whole country was named "Victoria Land" after the young queen: "Surely the whitest if not the brightest jewel in her crown."

Low-hanging clouds and gusts of snow prevented direct sight, but on the radar screen we could clearly make out the mountains to starboard. We, too, had reached the inner, ice-free, part of Ross Sea, and the ice-breaker had taken leave of us in order to prepare the way to the coast of Wilkes Land for the freighters *Arneb* and *Greenville Victory*. The next morning we passed Franklin Island and, soon afterwards, Beaufort Island, steep black rocks with a cap of ice, rising from the grey sea. Everybody was on deck looking eagerly to the south, where Ross Island, at first shrouded in clouds, appeared above some small icebergs. Steep fissured glaciers ran down into the sea from Mount Bird, while between them were black and red-brown rocks. Then a fresh southerly wind rose, it grew suddenly colder, the low clouds divided, and there Mount Erebus stood before us, high and massive, a breath-taking sight. When for the first time Ross and his companions saw this gigantic active volcano which, clad in ice, rises from the sea to a height of 13,350 ft., the impression may well have been enhanced by the knowledge of having at the same time reached what was then the greatest southerly latitude of almost 78 degrees. And for us to-day Mount Erebus, as a symbol of the classical period of Antarctic exploration, is also more than an outstandingly beautiful mountain in a high-polar landscape.

Slowly the ship slid into the McMurdo Sound, which is formed by Ross Island on the east and Victoria Land on the west. Sharply and ice-cold its mountains rose into the clear air above the great Piedmont glaciers. Over there, on Ross Island, Cape Royds passed by, where, at the foot of Mount Erebus, Shackleton had spent the winter of 1908. Cape Evans was sighted soon afterwards, and with the aid of glasses one could recognize the hut in which Scott, during his second expedition, had spent the winter of 1911, and above it a cross. Far to the south appeared Cape Armitage, the south-western promontory of Ross Island, the berth for Scott's ice-bound *Discovery* in the winters of 1902 and 1903.

Man's first experience of the Antarctic winter night was in 1898, when the Belgian expedition under de Gerlache, on the *Belgica*, froze into the ice in the vicinity of Alexander I Land and drifted helplessly for a year before it could be freed. Among the crew of the ship was Roald Amundsen, the first mate, Dr. F.A. Cook, who was later to acquire such questionable fame, and two Poles, as well as a Rumanian scientist. At long last Antarctic exploration had been revived again, not least because of the outstanding results of the oceanographic *Challenger* Expedition, which had worked in Antarctic waters during its long journey in the year 1874. The classical period of Antarctic exploration was ushered in by the first wintering on the mainland. In 1899 the British *Southern*

Cross Expedition under Borchgrevink had erected a hut at Cape Adare, where the first meteorological and magnetic observatory in the last new land on our earth began its pioneering activity. The following summer, at the beginning of the year 1900, the "barrier" discovered by Ross in 1841, known today as the Ross Ice Shelf, was visited. The first landing on this gigantic floating ice-table was contrived at longitude 164° west, at the point where Bay of Whales, as it was later called by Shackleton, began to develop, and at the edge of which Amundsen built his *Framheim* in 1911. The Antarctic summer was near its end when 78° 50' was reached with dog sledges, the most southerly latitude so far. Three years later Scott, Shackleton and Wilson, during the *Discovery* Expedition, reached 82° 17' south, along a gigantic mountain range which extended southwards as far as one could see as western boundary of the Ross Ice Shelf. Skelton and Armitage, in the meantime, had discovered a great glacier, which made a crossing of this range possible; from a height of 8850 ft. they could cast a first glance over the infinite expanse of the inland ice. In the summer of 1903/04 Scott advanced over this Ferrar Glacier far into the inland ice of Victoria Land, which "must be considered the most desolate region in the world. There is none other that is at once so barren, so deserted, so piercingly cold, so wind-swept or so fear-somely monotonous".

The first notable attempt at international co-operation in the exploration of Antarctica took place in the years 1901-3. In accordance with the recommendations of the Seventh International Geographical Congress at Berlin in 1899, three expeditions were to work in the Antarctic simultaneously during those years. Apart from Scott's *Discovery* Expedition, there was the German Antarctic Expedition under E. von Drygalski; it spent the winter of 1902 on the research ship *Gauss*, which had become ice-bound off the coast at longitude 90° east. Valuable scientific work was accomplished, and on the coast of the continent the Gaussberg was discovered, an extinct volcano 1200 ft. high. Quite close to it, at longitude 93° east, the Soviet observatory of Mirnyj has stood since the beginning of 1956. It is interesting that Scott as well as von Drygalski used captive balloons for obtaining a better survey over the wide expanse of snow. The third of the planned expeditions was the Swedish, directed by O. Nordenskjöld, which spent the winter of 1902 on Snow Hill Island, on the east side of Graham Land. In an attempt to pick up the expedition the next summer, the *Antarctic* was destroyed by ice pressure, but the crew was able to escape to Paulet Island. Split into separate groups, a second winter had to be endured under the most difficult conditions, until the rescue could be effected in November

1903 by an Argentine man-of-war. In spite of these adverse circumstances the scientific yield was very considerable, and really exciting contributions were gathered especially in respect of the geology of Western Antarctica. Somewhat later still, the Scottish Antarctic Expedition under W. Bruce set out for the Weddell Sea. The base station was erected in 1903 on Laurie Island, in the South Orkneys, and thence, in March 1904, was discovered the coast of Coats Land, which bounds Weddell Sea on the east. At the end of the expedition the meteorological station on Laurie Island was handed over to Argentina; it has been operating ever since without interruption. The results of this oldest continuous observation series south of latitude 60° are particularly valuable for the examination of the question of climatic variations in high southerly latitudes. On the west coast of Graham Land the French Antarctic expedition under J. Charcot had been successfully active between 1903 and 1905.

At the beginning of 1908 Shackleton returned to the Antarctic, this time as expedition leader. He had secured the co-operation of distinguished and active scientists, among them the young Australian Douglas Mawson, whose name, as leader of the Australasian Antarctic Expedition 1911-14, was later to become one of the most famous in Antarctica. Already late in autumn, Mount Erebus was climbed for the first time on March 10th, 1908, from Cape Royds, an exploit which was for decades the most important alpinistic achievement in the Antarctic. During the summer of 1908/09 the coasts and mountains of Victoria Land were surveyed and studied from the geological point of view. Professor David Mackay and Mawson succeeded in crossing the coastal range via the Larsen Glacier, and, after a long journey across the inland ice, on January 16th, 1909, reached the region of the South Magnetic Pole at 72° 25' south and 155° 16' east. Their thoughts were with James Clark Ross, who almost 70 years earlier had set out for the same goal. Shackleton himself was no scientist, but his strong and forceful personality, combined with a great capacity for exemplary hard work, made him one of the greatest expedition leaders ever to set out for the polar regions. His goal was "the heart of the Antarctic", the South Pole.

In a relentless battle against time, against cold, gales, glacier crevasses and hunger, this almost hopeless venture by four men nearly succeeded. The hardest part may well have been the decision to turn back, on January 9th, 1909, at 88° 23' south, only 97 miles from the goal. Shackleton's diary entry closes with the words: "Whatever regrets may be, we have done our best." The return march over the endlessly wide high plateau of the inland ice, at a height of some 10,000 ft., had not been started a day too early; Scott's hut at Hut Point

was only just reached on March 1st, after a march of altogether 1800 miles. By a signal fire the ship was summoned just in time, and on March 4th the *Nimrod* put out to sea through the rapidly forming new ice of the McMurdo Sound.

Traffic centre McMurdo Sound

This then was the state of exploration in the Antarctic 50 years ago. Shackleton had been a modern man; for the first time in the Antarctic, and with moderate success, he had used a motordriven vehicle on wheels, with an air-cooled 15-h.p. engine, for transporting loads on the sea ice. For the advance to the Pole, on the other hand, he had put his trust in the tractive power of ponies and men. Certainly he would not have thought possible what we were about to see, what was the end of developments resulting from the lessons of experience. On the last stretch of the voyage we had been accompanied by the ice-breaker *Northwind*, past the black rocks of Inaccessible Island and Tent Island, but now the open sea came to an end. At the edge of the Sound ice lay a big American freighter, the *John Towle*, and the small New Zealand expedition ship, the *Endeavour*. In the fresh wind our ship had some difficulty in tying up at the edge of the ice, and we watched the busy activity, the weasels and tractors pulling fully loaded sledges over 6 miles of uneven and unsafe Sound ice to the new base at Hut Point. The *Northwind* came alongside, three helicopters crowded on its small flight-deck, and on the bridge appeared Admiral Dufek, the leader of this, the greatest expedition which had ever operated in the Antarctic, which bore its name "Operation Deepfreeze" with some justification. A one-engined Otter with bright red wing tips landed on the ice, and the work of unloading began; men left the ship with all their belongings, and others came on board. Even towards midnight the hectic activity hardly ceased, for the sun still stood far to the south above the volcanic cone of Mount Discovery (9600 ft.) and every day of good weather had to be fully used. During the hours that followed, the large navy freighter *Merrell* arrived from Little America, accompanied by the ice-breaker *Atka*. Six ships now lay in the "harbour", the quays of which changed with every storm. High and cold, Mount Erebus stood above it, flying its smoke plume. Far to the south the large Koettlitz Glacier shone in the sun, while above it the Royal Society Range rose impressively, Mount Huggins (12,870 ft.), Mount R cker (11,260 ft.), Mount Hooker (12,400 ft.) and Mount Lister (13,353 ft.). The mostly snow-free foothills were somewhat distorted by mirage; higher up, in the completely clear air, as far as the glaciation of the flanks would permit,

we could see the pale-brown rocks with horizontal stratification, and the bright summit structure above layers of black rock.

Dr. Laurence M. Gould, geologist in Byrd's first Antarctic expedition of 1928-30, and to-day aboard our ship as director of the Antarctic research programme of the United States, willingly gave information: the foothills were formed of pre-Cambrian gneisses, slates and granites. In the Devonian, roughly 300 million years ago, the sedimentation of the sandstone series began, up to 6500 ft. thick, first described by Ferrar during Scott's *Discovery* expedition, and called Beacon sandstones. Wind-polished quartz grains, ripple marks and sun cracks point to a formation of these strata at a time of desert-like dryness. This warm climate must have lasted a very long time, into the Mesozoic, and at times there must also have been sufficient rain for vegetation. Enclosed into the sandstones one finds impressions of fossilized plants of the upper Carboniferous and Permian, belonging to the Glossopterian flora, and coal seams of varying thickness. The sandstones are flat-lying throughout, and the horizontal layer was also scarcely disturbed when in the Cretaceous considerable intrusions of dark dolerite took place. The resulting heat, however, largely decreased the value of the coal seams in places; their economic importance should therefore, for the time being, not be judged too optimistically. This sequence of strata corresponds even in details to the Gondwana Series of South Africa, India, Australia, Tasmania and South America, and to conclude that there was a uniform origin and a one-time close proximity of what to-day are widely separated shields cannot be rejected. It was probably not until the Tertiary that the East-Antarctic shield was very uniformly raised or tilted; the inner parts of the Ross and Weddell Seas were formed at that time along a subsidence fault.¹

The gigantic Antarctic horst range, which runs across the present-day continent from Cape Adare to Coats Land, was broken up into separate massifs during the lifting process. It is possible that the mighty glaciers which to-day flow through the horst range in places follow these faults. The large fracture between Ross Sea and Victoria Land was accompanied by volcanic eruptions, the traces of which can be recognized in the chain of volcanic islands (Balleny, Possession, Coulman, Franklin, Beaufort) as far as Ross Island, with the extinct volcanoes Mount Bird, Mount Terra Nova, Mount Terror, and the still active,

¹ This conception has been supported by the results of the research by A. P. Crary, during the I.G.Y. and the I.G.C. 1958/59, according to which the deepest part of the sea, under Ross Ice Shelf, immediately adjoins the edge of the mountains as a trough.

Mount Erebus. Professor David, after the first ascent of Mount Erebus, reported that the active crater had a diameter of at least 1600 ft. and a depth of 880 ft.; it was filled with sulphurous vapour. Traces of three older craters are still recognizable, the oldest measuring some eight miles in diameter. White Island, Black Island, Brown Island, Minna Bluff and Mount Discovery mark the fracture further south. These young islands consist of trachyte, basalt, and chiefly kenyte. Probably nowhere else can the geological history of the Antarctic Continent be studied to better advantage than here in the mountains around McMurdo Sound. But the work of the geologist is impeded by the fact that only about one thousandth of the Antarctic Continent is visible, i.e. not covered by ice, and of this only a small part has so far been geologically examined. In consequence the geological structure of Western Antarctica is for the present only known in its outlines. There mesozoic and tertiary sediments predominate, which have been thrust together to high levels by the Andine folding process and permeated by volcanic rocks. A rich flora of the Jurassic period has frequently survived in fossil form, as well as traces of giant penguins of the early Tertiary which are also known from Patagonia.

January 23rd, 1957, began as a warm and clear day; in cargo sledges, pulled by tractors, we drove to Hut Point, where the large McMurdo Camp had assumed the role of a traffic centre. On October 15th, 1956, the first planes of the spring, two-engined Neptunes P 2 V, two-engined Skytrains R 4 D, and four-engined Skymasters R 5 D, had arrived from New Zealand on a landing strip on the Sound ice, the first connection with the outside world for the 93 men who had wintered over. A few days later four-engined Globemasters C 124, with a pay-load of up to 23 tons, had landed here for the first time. They had brought amongst other things the one-engined Otter which we had already seen. During the long weeks before the ice girdle would break up and admit ships to the coast of the Antarctic Continent, the preparatory work for the International Geophysical Year could be continued. On December 20th, 1955, during the first phase of "Operation Deepfreeze", two Skymasters and two Neptunes had for the first time ventured the 2200 mile-flight from New Zealand across the Antarctic Sea to McMurdo. At the time four ships had been stationed for security at longitude 170° east, and this year, too, the destroyer escort *Brough* was on its way along the flying route as floating weather station and for emergencies. This precaution was undoubtedly necessary, as the flying time was from 12 to 14 hours, depending on the wind conditions, and if the only airfield on the Sound

ice should become unusable through one of the frequent and rapid deteriorations in the weather the possibility of return often no longer existed.

This bold development also rested upon the pioneering deeds of long ago. The first flight in the Antarctic was carried out on November 16th, 1928, by Sir Hubert Wilkins, from Deception Island at the northern tip of Graham Land; this was the beginning of modern Antarctic exploration. On November 28th, 1929, R.E. Byrd flew over the South Pole from Little America I, at that time a unique and bold achievement. The flight had been carefully planned, and a ground group with dog sledges gave weather reports. At that time and in the course of his later expeditions, Byrd developed the co-operation between ground groups and aeroplanes to a high stage of perfection. To-day, this technique of travel has become generally accepted in the Antarctic, dog sledges having been partly replaced by tractors. The aeroplane as a means of exploration made it possible that the last great gaps in our knowledge of the course of the coasts of the Antarctic Continent could be closed in the remaining ten years of peace. Byrd devoted the work of three expeditions to the Pacific sector between Ross Ice Shelf and Graham Land. New mountain ranges were discovered in Marie Byrd Land and in parts were studied geologically. Between November 23rd and December 5th, 1935, Lincoln Ellsworth succeeded in making the first flight across Western Antarctica from Graham Land to Ross Sea, with several intermediate landings and, as the most important result, sighted the Sentinel Range for the first time. The line of the coast in the Atlantic sector, between Coats Land and Enderby Land, was surveyed by Norwegian combined whaling and research expeditions, initiated by Lars Christensen. In the same area the German *Schwabenland* expedition, under Capt. A. Ritscher, charted an important high range from the air, during flights of up to 300 miles into the hinterland. The British-Australian-New Zealand Antarctic Research Expedition under Sir Douglas Mawson surveyed the essential features of the coast between Gaussberg and Enderby Land in 1929-31. Since 1954, when the Mawson Station was set up, the activities of the Australian National Antarctic Research Expedition had been concentrated in this area.

After the interruption in the exploration of Antarctica caused by the Second World War, a new expeditionary style began to assert itself. Large State enterprises progressively replaced private initiative, which had predominated during the classical period. The reasons for this were on the one hand the high costs of these modern expeditions, and on the other the desire to confirm political claims to the areas by continuous presence. Science certainly profits from this, even

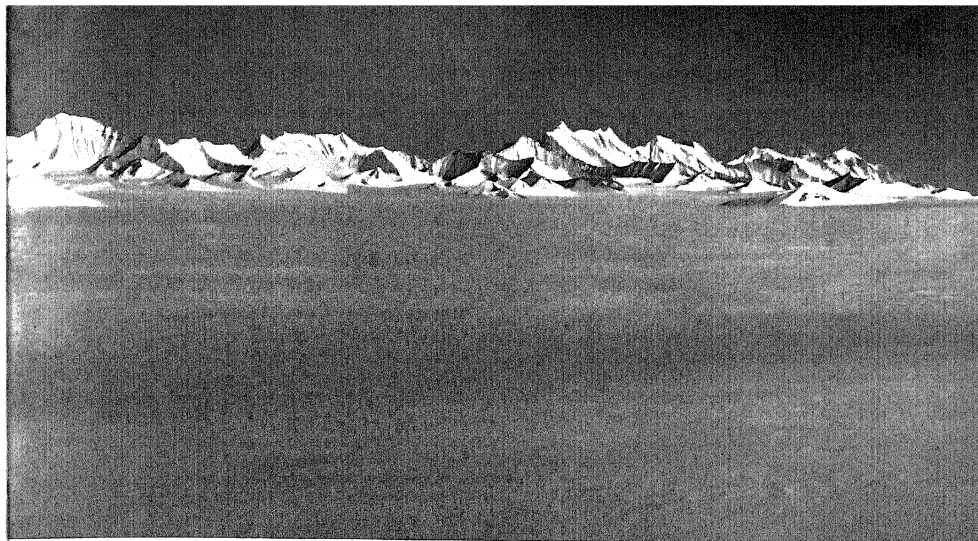
though the gains are not in proportion to the costs. The beginning of this development was characterized by the "Operation Highjump" of the American Navy in the southern summer of 1946/47, directed by Byrd. With an array, unknown in the Antarctic until then, of 13 ships, among them an aircraft carrier, and 4000 men, work was carried on in three independent groups. Little America IV was established on the Ross Ice Shelf as a temporary summer settlement of tents. In numerous flights the greater part of the coast of the Antarctic Continent and wide stretches of the hinterland were systematically photographed. The missing control points on the mainland were subsequently established by several helicopter landings from two ice-breakers in the next southern summer of 1947/48, during "Operation Windmill". The great yield in excellent aerial photos and comprehensive experience in the co-operation between ice-breakers, freighters and aeroplanes, gathered during these large-scale operations, were also of inestimable value for the planning and carrying out of other nations' expeditions during the International Geophysical Year. Admiral R.E.Byrd wrote in a report about the first phase of "Operation Deepfreeze" 1955/56, his fifth Antarctic expedition, which had been assigned the task of preparing the American contribution to the exploration of Antarctica in the I.G.Y.: "To a man who has devoted thirty years of his life to exploring the polar regions and preaching the importance of Antarctica, it is an enormous satisfaction to see this job at last get the tools that it demands." A brilliant confirmation of the correctness of this realisation were the nine long reconnaissance flights from McMurdo, between January 3rd and 12th, 1956. In six flights the Australian quadrant between Victoria Land and longitude 90° east, the interior of which was still completely unknown, was reconnoitred. Two further flights provided information about the central part of the Antarctic Continent that is the most difficult to reach, round the Pole of Relative Inaccessibility, at latitude 82° south and longitude about 60° east, where the shield of the inland ice rises to a height of 13,000 ft. and is not pierced by any mountain peak. During the last, and at that time longest, reconnaissance flight, Torbert and Hawkes took 19 hours to fly from McMurdo across the South Pole to the Weddell Sea and back, a distance of 3400 miles. By sighting four new mountain ranges south of Weddell Sea, which apparently formed the continuation of the great horst range to Coats Land, this flight was also the most successful in respect of its results.¹

¹ Between October 24th and 26th, 1958, in an outstanding flight, a Soviet plane accomplished the 2500 miles from Mirnyj via the South Pole to McMurdo Sound in 14 hours, returning direct to Mirnyj via Wilkes Land after a short stay.

After a few months of the most intensive preparations the second phase of "Operation Deepfreeze" had begun; the planes had arrived at McMurdo early in the year, as scheduled, though unfortunately not without loss. The work of realizing a bold plan was begun at once, a plan until then without equal in the history of Antarctic exploration: a landing by plane at the South Pole was to begin the erection of a research station there, where on January 18th, 1912, Robert F. Scott had faced the bitter realization that Roald Amundsen had beaten him by five weeks. No man had trod there since. On October 31st, 1956, the flight was undertaken by a two-engined R4D Skytrain, after a small relief station had already been established halfway, at the outflow of the Liv Glacier into the Ross Ice Shelf. Conrad S. Shinn, one of the best pilots ever to fly in the Antarctic, managed to put the ski-plane (appropriately named *Que sera sera*), down at the South Pole and take off again after a stay of 49 minutes. To-day, hardly four years later, when landings and take-offs with ski-fitted planes are carried out on the Antarctic inland ice by experienced pilots as a matter of routine, it may seem difficult to conceive the tense atmosphere in which this bold flight into the unknown was done. At that time, on our drive over the uneven sea-ice to the camp at McMurdo, we were still deeply impressed by this unusual event which had been prepared with utter precision. Already the olive-green "Jamesway" tent-houses of the station were visible, and the red huts which had been assembled from prefabricated parts, colourful spots upon the dark volcanic scree, in between a crowd of men and the tractors. In the vicinity of Scott's hut two petrol tankers lay frozen into the ice; on the Sound ice stood a number of planes, their bright red wing-tips and tail-fins shining in the sun.

For a short time the bustle in the camp ceased, and in a simple ceremony, beneath the flags of Great Britain, Norway and the USA, the opening of the South Pole Observatory was commemorated; it had commenced work two weeks earlier, under the direction of Paul A. Siple, the loyal companion of Admiral Byrd on all his Antarctic expeditions. On November 19th, 1956, a group of men had been put down at the Pole, and the construction of the Pole Station, from material dropped by Globemaster transport planes in continuous flights, began; weasels and tractors, fuel, and the separate parts of houses descended on parachutes. Up to December 18th 430 tons were delivered; then the huge planes had to return to New Zealand, since the landing strip on the Sound ice was no longer safe. The small R4Ds and the P2Vs had then to take on the further supplies, but the Pole station had become a reality, in good time for the I.G.Y.

The meteorologists waited for each figure with real excitement, for after all





52 Preceding photograph, top: SOUTHERN PART OF SENTINEL RANGE with peaks above 13,000 ft., seen from the west. These mountains, rising steeply above the snowy plateau situated at 5500 ft., are about 30 miles away.

bottom: VIEW FROM THE SLOPES of the extinct volcano Mt. Takahe ($76^{\circ}16'S$, $112^{\circ}14'W$, 11,400 ft.) towards south-west, across the vast snowy plateau of Marie Byrd Land (elevation approx. 4000 ft.). In the background on the right, the volcanic Cray Range ($76^{\circ}50'S$, $118^{\circ}W$, 12,400 ft.). These mountains were discovered during the Marie Byrd Land crossing 1957/58. (Photographs by William E. Long, USNC-IGY)

53 HIGHEST PEAK IN THE SENTINEL RANGE (15,334 ft.), seen from the west. Rock faces approx. 6500 ft. high, consist of metamorphic schists. The name Mt. Ellsworth was proposed for the Mountain, which might prove to be the highest peak in Antarctica. (Aerial photograph on December 15th, 1959, by U.S. Navy for U.S. Geological Survey)

no observatory had yet carried out continuous observations in the heart of Antarctica. The first attempt to obtain such figures was undertaken by Byrd, when, at the beginning of the winter of 1934, he erected "Bolling Advance Base" just 125 miles south of Little America II, at latitude 80° south. Byrd spent the whole winter darkness alone at this advanced post, and carbon monoxide poisoning had almost brought the bold undertaking to a tragic end. As the first station in the marginal area of the inland ice, the Pionerskaya Observatory had been opened, on May 27th, 1956, by the preparatory Soviet expedition, at latitude $69^{\circ} 44'$, 235 miles south of Mirnyj and at a height of about 8850 ft. Now, towards the end of the Antarctic summer, further stations on the inland ice were under construction, in order to start work even before the beginning of the International Geophysical Year.

In the afternoon we sat a long time at the top of the volcanic Observation Hill (750 ft.) and gazed over the wide landscape. Far below, at Pram Point, the New Zealanders were erecting their station, Scott Base, and above it, immaculately white, stood Mount Terror (11,400 ft.). Over there, where in the distance White Island and the elongated ridge of Minna Bluff rose from the ice, Scott and his brave companions, weakened by hunger, had died in a raging snow storm 45 years earlier. A tall cross on the top of Observation Hill bears the names of these men, with Tennyson's words: "To strive, to seek, to find—and not to yield", which to this day are obligatory advice to any Antarctic exploration. To-day, 45 years later, many things have become different and easier in the Antarctic. What has remained unchanged is the challenge of the unknown beyond the sweeping line of the white horizon. And now members of eleven nations were peacefully using their technical resources in a joint effort to explore the last great piece of the globe's surface still largely unknown.

U.S.-I.G.Y.-headquarters Little America V

On January 28th, 1957, we put out of the Sound, guided by the ice-breaker *Atka* and accompanied by the freighter *Merrell*; our destination was Little America V, 500 miles further east. Large pieces of the ice table had broken off in the last few days; unloading had to be called off for the time being, and tractors and weasels withdrawn from the treacherous Sound ice to solid earth. Behind us were smoking Mount Erebus and the sites of Antarctic history at its foot; before us lay the task of the I.G.Y. We rounded a large tabular iceberg which had stranded at Cape Bird; smaller ice-floes drifted past, some crowded with penguins as if on a conducted tour. Unapproachable, with its steep slopes heavily iced,

Ross Island rose out of the sea, and then before us there stood, above the black rocks of Cape Crozier, Mount Terror, the last mountain for many months to come. Here began the gigantic wall of the Ross Ice Shelf, along which we sailed in our fast ships for over 24 hours. It rises 60 to 100 ft. from the dark-blue water, guarded by rugged overhanging ice, and below the water it goes down to a depth of about 800 ft. A few tabular icebergs, which had apparently broken off not very long before and were brilliantly lit by the sun, drifted in the sea.

The next day the sky was overcast, a cold southerly wind drove the snow over the edge of the barrier, the ship pitched in the rough sea, and far to the south the ice blink stretched from horizon to horizon, the reflection of the snow from the base of the low clouds. Towards midnight the ships put into Kainan Bay, a large bight in the floating ice edge, which had been discovered at the beginning of the year 1912 by the first Japanese Antarctic expedition in the *Kainan Maru*. In the early hours of the morning large helicopters, which flew continuously, began the transport from the ship to the ice shelf. After a few minutes, in crowded discomfort between sacks and cases, we were at our destination in the Antarctic city of Little America V, at latitude 78° 11' south and longitude 162° 10' west.

This station had been erected at the beginning of 1956 some three miles from the inner edge of Kainan Bay, and 73 men, whom we were now to replace, had spent the winter there. They had successfully accomplished a more difficult task than that which awaited us. From now on Little America V was to be the headquarters of the seven American stations in the Antarctic. The station was there, and we scientists could devote ourselves exclusively to our task from the very first day. The main achievement, however, was the erection of Byrd Station at latitude 80° south and longitude 120° west, at a height of 4970 ft. on the wide inland-ice plateau, 62½ miles distant from Little America V. This inland-ice station depended largely upon land transport, since, for the short period during which the airstrip on the Sound ice of McMurdo was usable, the station at the South Pole had to be supplied from the air. But first a safe route had to be found through the crevasse zone which had been detected by aerial reconnaissance at the ascent from Ross Ice Shelf to the Rockefeller Plateau. As early as January 14th, 1956, a first reconnaissance group had set out with two snow-cats, a weasel and an Otter plane, for aerial reconnaissance, but unexpected difficulties had occurred, and on March 5th a heavy tractor had crashed into a crevasse and been lost with its driver. A snow bridge over a crevasse, which had been crossed by the lighter snow-cats, had given way under the 38-ton D8 tractor. But one cannot

do without the enormous tractive power of these heavy machines, which can pull two cargo sledges with a pay-load of 20 tons each.

After the winter-night, on November 5th, 1956, a group of eleven men set out once more to find a new and better route. Specialists of the U.S. Army, with comprehensive experience in Greenland, had been called in, and the crevasse-detector developed by John C. Cook was used with excellent results. A weasel, driving ahead of the tractor-train, detected the concealed crevasses; these were then opened by explosives and a tractor shovelled snow into the crevasse until a safe path had been built. But the crevasse-detector is not entirely reliable in indicating crevasses with snow bridges more than 15 ft. thick. Even bridges of this thickness collapse under the weight of a tractor and two loaded sledges totalling about 100 tons. After four weeks of hard labour the difficult task had been done, and a safe route been constructed and marked through the crevassed zone. On December 6th, six tractors with 12 cargo sledges in all set out. Moving continuously for 24 hours a day, like a convoy on the high seas, navigating by the sun and relying on fuel depots established from the air, the huge column of sledges arrived on December 23rd, 1956, at the spot where the scientists had asked for a station. If the experts who had successfully devised the "Army-Navy-Drive" had been rewarded by a unique experience, the scientists, too, were to obtain completely unexpected results in this unknown part of the Antarctic. On January 28th, 1957, a further column of tractors had started from Little America and reached Byrd Station on February 12th. It was possible to erect the buildings in late autumn under great difficulties. In February the Globemasters had been able to resume their flights and they dropped urgently required fuel. From the beginning of March the station, with 23 men (13 of them on the scientific side), under the leadership of George R. Toney, was cut off from the outside world. As at all other stations, there was a doctor, who was also in charge of the Navy personnel.

At Little America, in the meantime, some 5000 tons of material had been unloaded from the ships—an impressive achievement. By intensive blasting the edge of the ice had been freed of all sections which might break off, and the ships were able to make fast to the ice wall itself, still some 50 ft. high. Most of the loads had at first been put down at a clearly arranged depot near the edge of the barrier, where the scientists could fetch the cases most urgently required. We all had our hands full in unpacking the instruments and taking the first preliminary readings. It was a great relief to find that my highly sensitive radiation instruments, too, had survived the long journey intact. After last consultations

with Dr. Harry Wexler, the scientist in charge of the Antarctic research programme, the ships departed on February 5th, 1957.

The month was spent on erecting the instruments and laying the cables to the recording apparatus in deep trenches, so that they should not be damaged by the tractors. The late-summer weather¹ afforded pleasant work in the open, in conditions comparable with very cold winter days at home in far away Austria, with the sole difference that here the sun did not set. At night the sun stood very low on the horizon, shedding warm violet and red light over the snow, while above a grey fog-bank on the northern horizon stood, lemon-yellow, the full moon. One could not help stepping gently so as not to disturb the quietness of the wide snow landscape with the sound of crunching snow.

At the beginning of March the autumn made its entry with the first storms. Driving snow filled the air and reduced visibility, but it also began to envelop the huts of the camp with protective snow drifts. Although the actual snowfall is very small everywhere in the Antarctic (the yearly mean for the whole continent is about 120–150 mm. of water equivalent or 40–50 cm. in depth of snow), yet great masses of snow are deposited around all obstacles, until the surface is again as unbroken and as smooth as possible. The wind shifts the snow unceasingly, eroding it in many places and raising elongated dunes, which have been given the Russian name *sastrugi*, or, in a rarer form, *barchane*—crescent-shaped dunes. Although the snow in these dunes is tightly packed and very firm, each new storm cuts up the old dunes into fantastic shapes, bringing out all differences in solidity with a jet of fine hard crystals. Soon our ski-tracks ran like dams across the surface of the snow, submerging in places below new dunes. When the wind began to blow it was startling to watch how the snow surface sprang to life, how the first glittering drifts wriggled along the ground with a thin metallic sound, until the sweeping snow grew ever higher and denser, and everything finally was drowned by a whirling white stream. Very soon one got to know the true ruling powers in this wide white land—the storm and the drifting snow—and to respect their laws.

On March 9th the ice-breaker *Northwind* paid us a visit and brought mail and fresh vegetables for the last time for seven months. Airmen and wireless operators, mechanics and electronics-technicians, pioneers and scientists remained behind, in all 109 men who had long since become one community. This was not only because Capt. W.M. Dickey, as the military leader, and Dr. Albert P. Crary,

¹ Average monthly temperature for February, 1957, was -12.2° C.

as the scientific leader of the American stations in the Antarctic, got on well together, but also because the Navy people apparently liked to pave the way for the somewhat strange scientists, and the scientists in turn were truly grateful for being granted these opportunities for work. On March 12th we received the news of Admiral Byrd's death; only a year before, on January 8th, 1956, when he flew over the South Pole for the third and last time, he had been able to convince himself that the completion of his life work was in good hands. As if to honour the memory of this great polar explorer, the opportunity occurred the next day for a flight to Little America III, about 35 miles away. Nine antenna poles projected from the snow, and we climbed down through a shaft. There, 18 ft. below the surface, stood one of the buildings of Little America IV; a passage led on, and about 30 ft. below the surface stood the station of Little America III, just as it had been left 17 years before. All the huts were still there and accessible; large ice crystals glittered in the light of the pocket torches, and in the glaciologists' pit interesting comparative measurements were possible. Every year above our Little America V, too, 20 inches of snow would be deposited and it would shift with the ice-table about 400 yards to the north, until it broke off with a tabular iceberg and drifted out into the stormy sea.

The Winter Night

It was growing noticeably colder, and the air was more frequently filled with fine glittering ice-crystals, in which halos of great splendour appeared. The days grew rapidly shorter and the wind stronger, but one scarcely wondered any more about how long we could work and take readings in the open at temperatures of -40° C. The instruments were all mounted and promised to give reasonable results, and this anxiety at least had disappeared; the work normalized itself, became routine. On Palm Sunday, a cold clear day in mid-April, we strolled to the edge of the barrier. Kainan Bay was frozen over for a long way out; rimy icicles hung in the hollows of the surf and the low sun poured warm fairy-like colours over the snow. On April 22nd we saw for the last time a small segment of the sun emerging above the northern horizon and disappearing again at once—this time for four months. Now, on every clear day, a warmly glowing purple light stood on the northern sky, merging subtly and harmoniously into the night-blue zenith and the cold-grey shadow of the earth to the south. At night the polar lights flamed splendidly in silent magnificence in the sky, green curtains mysteriously moved and enlivened by flashes of yellow light. A strange magic emanated from it, which nobody could resist and cannot be put into words.

Small and marvelling, we stood below the immense sky, forgetful of the fact that the temperature was -50° C. Then we returned to the warmth and security of the camp, to work or for a game of chess with Vladimir, our Russian meteorological colleague, or for a friendly chat with Fred Milan, the physiologist, who was indefatigable in devising odd experiments for checking the state of our acclimatisation, and with Dr. Unger, who had just successfully relieved an expedition member of his appendix.

In mid-May there were several days of storm; warm air streamed in from north to north-east, the temperature rose to within a few degrees of zero, which was by no means pleasant. At the same time at the South Pole Station the temperature fell below -70° C.! Through knee-deep snow drifts and from one marking flag to another we groped our way to the instruments. The light of our pocket torches was soon swallowed up in the whirling snow drifts; snow penetrated our clothing, and it trickled even through the smallest cracks into the passages of the camp. The instruments stood this hard test very well. When on May 15th the strongest gusts exceeded 75 m.p.h., we glanced anxiously again and again at the recording apparatus, but still the instruments reported back. An attempt to reach the instruments was thwarted; to find one's direction was absolutely impossible and breathing was difficult. It was an impressive demonstration of what a blizzard can be; nobody was permitted to leave camp, which would have been possible only by way of scuttles. When the storm subsided, only the highest of the sensitive anemometres had been blown away, and the net radiometer was completely unharmed. The camp huts were now buried in snow up to their roofs, and from now on all entrances had to be shovelled free after each storm.

Then the weather cleared up; the wind turned to south, it grew bitterly cold, and again the green-yellow rays of the polar light flashed across the sky, slowly vanishing and re-appearing elsewhere, radiating from the zenith, from the Southern Cross. Around the full moon, through the reflection and refraction of the light in the ice-crystals, there grew a halo; the parhelic circle with the mock moons and the vertical light-pillars formed a large cross which rested with a broadened base on the horizon, while to right and to left the mock moons formed two smaller crosses. Such manifestations of the most subtle beauty alternated with storms of breath-taking strength; the two extremes were equally unforgettable impressions, both paid for by isolation and privation.

The International Geophysical Year (I.G.Y.) began on July 1st, 1957, a clear day at a temperature of -40° C. and a radio black-out caused by a disturbance in

the ionosphere. But even without radio communication we knew that besides ourselves there were another 46 stations south of latitude 60° which had been operating for months, and that in addition there were a further eight stations on the sub-Antarctic islands. The general assembly of the International Union of Geodesy and Geophysics, meeting in Rome in the autumn of 1954, had recommended that special attention be paid to the exploration of the Antarctic Continent in the I.G.Y. The world-wide character of all the branches of geophysics made it appear unlikely that the scientific aim of the I.G.Y. could be attained without the same observations being available from the Antarctic as were being gathered in all other parts of the globe by the co-operation of scientists of 66 nations. In July 1955 representatives of eleven nations met in Paris in order to discuss and co-ordinate their proposals for the Antarctic research programme and above all to agree on the number and locality of the stations to be erected. And so at last the great moment for the exploration of Antarctica had started, of which the pioneers may have dreamed often enough. Of course, not all the plans of the scientists could be put into practice. In spite of all technical resources Nature is still imposing certain limits to human activity in Antarctica. The realization of some plans was postponed; others had to remain wishes, but nevertheless 22 stations had been established on the main mass of the Antarctic Continent for the purpose of the I.G.Y. Three additional stations were built in the summer of 1957/58.

The Americans had realized the most ambitious programme and established seven stations. Apart from the inland-ice stations at the geographical South Pole and in Marie Byrd Land, the supply base at McMurdo Sound, and the central station of Little America V, there were Ellsworth Station on the Filchner Ice Shelf, in the south part of Weddell Sea, Wilkes Station on the Vincennes Bay in Wilkes Land, and the station at Cape Hallett, which was operated jointly with New Zealand. In addition, New Zealand had established Scott Base on Ross Island. The French had resumed their activity in the coastal region of Terre Adélie (1948-53) and, apart from the station of Dumont d'Urville, had erected Charcot Station on the inland ice, 200 miles from the coast and at a height of 8000 ft. The programme of the Soviet Union was, after that of the United States, the most comprehensive. From the large, excellently equipped, coastal observatory at Mirnyj, two stations were to be placed far into the interior of Eastern Antarctica: Vostok in the region of the South Geomagnetic Pole and Sovetskaya at the Pole of Relative Inaccessibility. At first they had to be content with establishing, from the advanced station of Pionerskaya, the temporary station of Vostok I at

a halfway point, 395 miles from the coast and 10,300 ft. up. In addition, there was the coastal station of Oasis, in the Bunger Oasis discovered by the Americans in the course of "Operation High Jump".¹

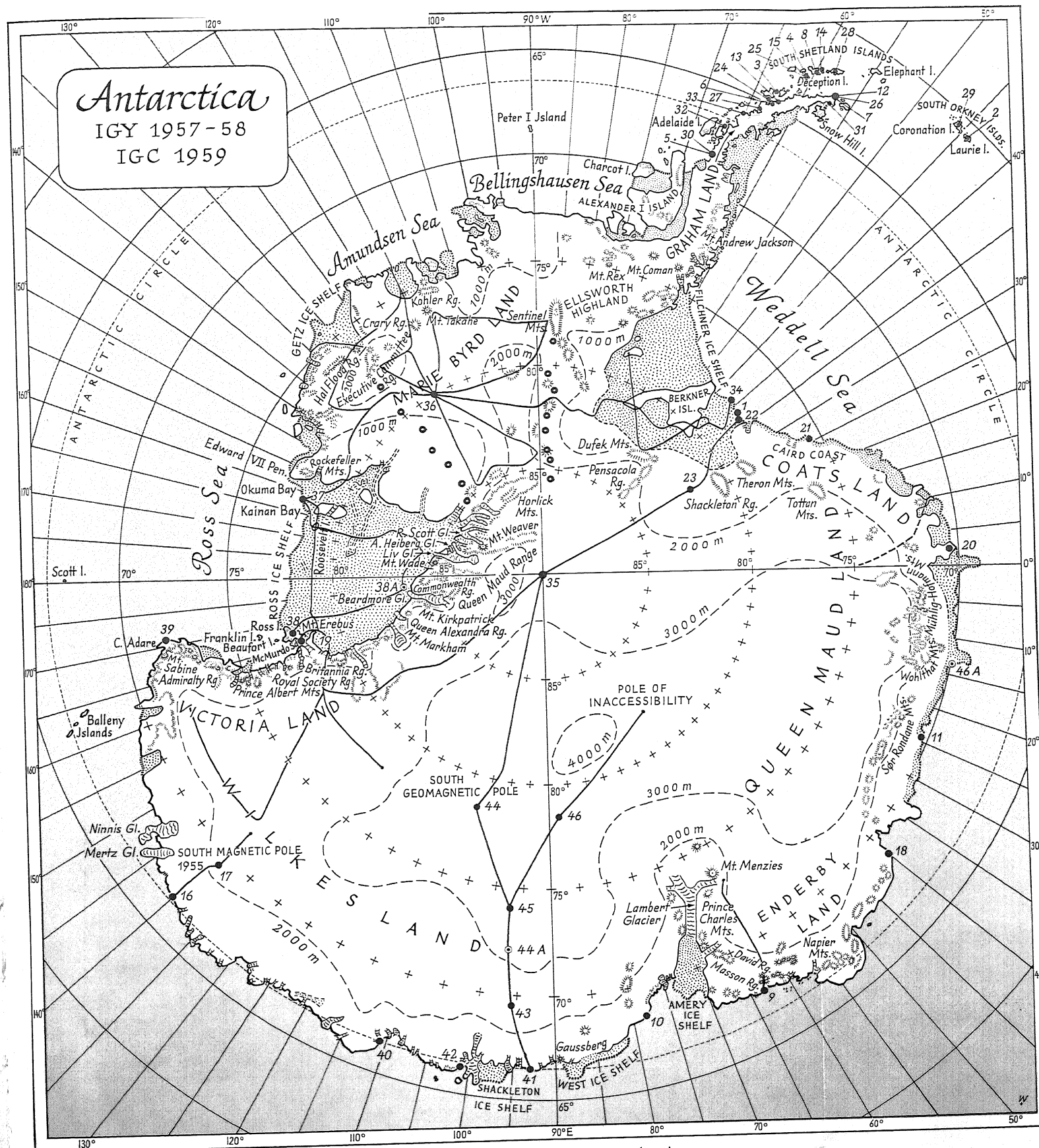
Since 1948 the Australians had maintained stations on the Sub-Antarctic islands, and as early as 1954 had erected Mawson Station on MacRobertson Land. Now the small Davis Station, in the Vestfold Hills on the Ingrid Christensen Coast, had been added.

The Japanese, too, had returned to the Antarctic, and had established Syowa Station on the Prince Olav Coast, at latitude 69° south and longitude 40° east.² The Norwegians had erected their station again on the Princess Martha Coast, some 185 miles east of Maudheim, the base station of the Norwegian-British-Swedish Antarctic Expedition of 1949-52. This expedition had been one of the most successful to set out for the Antarctic, and in many respects an example for the ones working there now. Gordon de Q. Robin, an Australian physicist, to-day Director of the Scott Polar Research Institute at Cambridge, had made the first seismic profiles as far as 370 miles into the continent, and at 350 miles obtained an ice thickness of 8200 ft. This was the point where our ideas about the ice-masses covering the Antarctic Continent began to be revolutionised. V. Schytt had taken the first deep borings into the shelf ice up to a depth of 330 ft., and found that the snow got denser and denser until the clear ice was reached at a depth of about 200 ft. We, in Little America, were happy to have at least parts of the scientific work of this expedition available to us in proofs, which were studied over and over again.

On Caird Coast, in Coats Land, Great Britain established the I.G.Y. station of Halley Bay in 1956. The Commonwealth Trans-Antarctic Expedition was

¹ Not until the following summer was it possible to push a subsidiary station, Komso-molskaya, somewhat further into the inland ice, and thence, on December 16th, 1957, the Vostok station was established on the site intended, 875 miles from the coast and 11,220 ft. up. Sovetskaya Station was erected on February 16th, 1958, just before the winter set in, at an altitude of 11,700 ft., still some 450 miles away from the Pole of Inaccessibility. The point is not named without a certain justification, even in our day which takes such pride in its technical resources. Not until December 14th, 1958, just before the end of the I.G.Y., was the goal reached, at a total distance of 1300 miles from the coast and an altitude of 12,200 ft. After a stay of only 12 days, the return journey was started, without the possibility of leaving a manned station. The great height was a decisive factor in making this decision, for the ice plateau in this region rises to above 13,000 ft. Here, too, is probably the coldest region in the Antarctic, and therefore on the whole surface of the earth. From readings of the snow temperature taken from the bore holes intended for seismic measurements of the thickness of the ice, an annual mean temperature of about - 57°C. could be concluded.

² Further, on the coast of Queen Maud Land, at the beginning of 1958, the Belgians constructed their station, Roi Baudouin, 60 years after the memorable expedition of the *Belgica*.



I.G.Y. STATIONS SOUTH OF 60°

Argentina

1. General Belgrano	77° 58' S	38° 44' W
2. Orcadas	60° 45' S	44° 43' W
3. Melchior	64° 20' S	62° 59' W
4. Deception	62° 59' S	60° 43' W
5. General San Martin	68° 08' S	67° 06' W
6. Almirante Brown	64° 53' S	62° 52' W
7. Esperanza	63° 24' S	56° 59' W
8. Teniente Camara	62° 37' S	58° 57' W

Australia

9. Mawson	67° 36' S	62° 53' E
10. Davis	68° 35' S	77° 58' E

Belgium

11. Roi Baudouin	70° 26' S	24° 19' E
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Chile

12. Bernardo O'Higgins	63° 19' S	57° 54' W
13. Gonzalez Videla	64° 49' S	62° 51' W
14. Arturo Pratt	62° 28' S	59° 37' W
15. Pedro Aguirre Cerda	62° 56' S	60° 36' W

France

16. Dumont d'Urville	66° 40' S	140° 01' E
17. Charcot	69° 22' S	139° 02' E

Japan

18. Syowa	69° 29' S	39° 35' E
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New Zealand

19. Scott-Base (see Nr. 39)	77° 51' S	166° 45' E
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Norway

20. Norway Station	70° 30' S	02° 32' W
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United Kingdom

21. Halley Bay	75° 31' S	26° 36' W
22. Shackleton	77° 57' S	37° 16' W
23. South Ice	81° 56' S	29° 30' W
24. Port Lockroy	64° 50' S	63° 31' W
25. Deception Island	62° 59' S	60° 34' W
26. Hope Bay	63° 24' S	56° 59' W
27. Argentine Islands	65° 15' S	64° 16' W
28. Admiralty Bay	62° 05' S	58° 25' W
29. Signy Island	60° 43' S	45° 36' W
30. Horseshoe Island	67° 49' S	67° 17' W
31. View Point (Duse Bay)	63° 32' S	57° 24' W
32. Detaille Island	66° 52' S	66° 48' W
33. Prospect Point	66° 00' S	65° 24' W

United States

34. Ellsworth	77° 43' S	41° 08' W
35. Amundsen-Scott	90° 00' S	2800 m
36. Byrd	80° 00' S	120° 00' W
37. Little America V	78° 11' S	162° 10' W
38. McMurdo Sound	77° 50' S	166° 36' E
38A. Beardmore (summer only)	83° 30' S	175° 00' E
39. Hallett (with New Zealand)	72° 18' S	170° 18' E
40. Wilkes	66° 15' S	110° 31' E

U.S.S.R.

41. Mirnyj	66° 33' S	93° 01' E
42. Ozais	66° 16' S	100° 45' E
43. Pionerskaya	69° 44' S	95° 30' E
44. Vostok	78° 27' S	106° 52' E
44A. Vostok I	72° 08' S	96° 35' E
45. Komsomolskaya	74° 05' S	97° 29' E
46. Sovetskaya	78° 24' S	87° 35' E
46A. Lazarev (since March, 1959)	69° 58' S	12° 55' E

Blue lines = Traverse routes

Blue circles = Airborne Traverse Stations

Blue dots = I.G.Y. Stations

interested in gaining a starting point further south. At the beginning of 1956 Shackleton Base was established on the Filchner Ice Shelf, in the vicinity of Vahsel Bay, which had been discovered at the beginning of 1912 by the *Deutschland* expedition under Wilhelm Filchner. In February 1957 South Ice Station was established from the air on the intended route to the Pole, at a height of 4400 ft., 280 miles from the coast.

As early as 1909 Filchner had pursued the plan of crossing the Antarctic Continent from the Weddell Sea to the Ross Sea, in order to ascertain whether an ice-covered arm of the sea connected the two deep indents and thus divided the continent into two halves. As it proved impossible to raise sufficient funds in Germany for two ships, Filchner had to drop the plan of making a crossing, and restrict his exploration to the Weddell Sea, into which he penetrated further than any other had done before him. Just when he was erecting a winter base on the ice shelf, a great calving took place and the expedition had to retreat to the *Deutschland*. The ship froze into the pack-ice and drifted for nine months for a distance of over 600 miles, before it broke free again in November 1912. Differences of opinion among the expedition members made it impossible to continue the expedition; the ship was sold to an Austrian Antarctic expedition which was then in the planning stage, but which unfortunately fell through because of the start of World War I. Just at this time Shackleton had finished his preparations for the Imperial Trans-Antarctic Expedition. On August 8th, 1914, the *Endurance* left England, but on January 19th, 1915, even before the Filchner Ice Shelf was reached, the pack-ice had firmly closed round the ship. The drift came off none too happily, because on November 21st, 1915, the *Endurance*, which had previously been heavily damaged by ice pressure, sank. With great trouble and privation, the boats were dragged over the ice until a landing could be achieved on Elephant Island in the South Shetlands, on April 15th, 1916. A new winter was coming on, and Shackleton with five companions decided on one of the boldest of sea journeys, the sailing of 800 miles in a small open boat across the stormiest ocean in the world, in order to get help at the whaling station on South Georgia for the 22 men who had stayed behind. On May 9th South Georgia was reached, but on the wrong, uninhabited coast. Under winter conditions the mountainous island was crossed for the first time. Three desperate attempts, with quickly chartered ships, to pick up the men left behind on Elephant Island miscarried because of the heavy pack-ice; only the fourth attempt, on August 30th, 1916, was successful. With this fantastic epic the classical period of Antarctic exploration had found its end. Now, half a

century after the first plans had emerged, the crossing of the Antarctic Continent was attempted once more; an undertaking that linked the great tradition of the classical period with our more sober age and its technical resources, without which it would not have been possible.

Only about 20 miles west of Shackleton the Argentine station of General Belgrano had stood since 1955, and another 30 miles west of that the American Ellsworth Station already mentioned. The ice-breaker *Staten Island*, together with the freight *Wyandot*, had sailed along almost the whole front of the Filchner Ice Shelf, which had never before been achieved, but could find no suitable site for the erection of a station in its western part. Thus, the close proximity of these three stations had been imposed by nature, just as had the gap in the Pacific quadrant, regretted by all scientists, between longitudes 70° and 160° west. The Bellingshausen and the Amundsen seas, between Alexander I Island and Edward VII Peninsula, have such difficult ice conditions that even strong modern ice-breakers are not yet able to prepare a safe passage for freighters to the coast.

The conspicuous accumulation of 21 stations on Graham Land, the South Shetlands and the South Orkneys, had different reasons. Here the claims of Argentina and Chile to the area of the British Falkland Islands Dependencies overlapped. The somewhat ridiculous removal of each other's national emblems appears to belong to the past, and the first regrettable warning shots of February 2nd, 1952, were, one hopes, the last to be fired in the Antarctic.¹ Science can only profit from this enhanced activity, and in the ten British, seven Argentine and four Chilean stations, which had already been in existence for several years, scientific work was done which fitted well into the framework of the I.G.Y. programme. Here the topography of the terrain is so complicated that a great number of stations appears to some extent justified.

Forty-six stations operating simultaneously, that was an unique event in the history of Antarctic exploration! But even this impressive figure shrinks somewhat, if one takes into consideration the wide expanse of the area over which the stations were distributed. The Antarctic Continent, as we see it today, comprises an area of almost 5,500,000 sq. m., that is half the size of Africa and considerably larger than Australia. Every winter it expands by the surrounding seas freezing firmly within a radius of 300 to 1000 miles; there are vast areas

¹ In October 1959 twelve nations, meeting at the invitation of the United States of America, agreed in the course of a conference in Washington that "Antarctica should not become an object of political conflict and should be open for the conduct of scientific investigations". The Antarctic Treaty was signed on December 1st, 1959.

of which even to-day nothing is yet known. About 90% of the ice volume of the earth lies here, whereas the ice of the Arctic, chiefly the inland ice of Greenland, contributes about 9%, and all the glaciers of the high mountains on our earth represent only 1% of the ice masses which to-day still cover one tenth of terra firma. Thus the Ice Age has not yet ended, and we can study its regime, so hostile to life, in the Antarctic. From it we shall learn to interpret the most recent geological past of our earth and gain a better understanding of the concerted action of the geophysical processes determining the present picture of our planet. The importance of the Antarctic does not lie in its supposed mineral resources nor in a hypothetical strategic value, but in the scientific knowledge which can be gathered there.

The beginning of the I.G.Y. brought no change into our working day. Every favourable day was used for measurements and for calibrating the instruments. Favourable for radiation measurements meant clear weather, without much wind, and even if the temperature then kept mostly below -50°C ., one could bear it with the instruments for one or two hours, thanks to our very suitable clothing, before the tears freezing on our eye-lids made a break for coffee seem desirable. Unfortunately, such peaceful days were the exception; when wind arose it was bitterly cold, even if the temperature then rose to above -40°C . It became rather problematical how to remove the hoar frost from the sensitive instruments with one's bare hands, although we soon learnt to estimate for how many seconds one could safely expose one's fingers without any serious injury. It is hardly surprising how helpless one felt faced the eagerly awaited radio news from home, telling of a heat wave on the Adriatic beaches, like a message from another world. A talk by radio with my friend Norbert Untersteiner, who was working on an ice-floe in the vicinity of the North Pole, in the brightness and humidity of the Arctic summer, awakened memories of that small tent on the Vernagtferner, in the depths of the Ötztal Alps, where many years ago the problem of the heat balance of the glaciers had begun to attract our attention.

The Return of the Sun

At the end of July glowing red cirrus clouds on the northern horizon and, on clear days, a good twilight towards midday, announced the return of the sun and the end of the long night. But it was still winter; awe-inspiring storms made any measurement in the open impossible for days, until one could again climb to the surface and look after the instruments. One had much work as a scientist, more than one could really manage, and again and again one was fascinated by

new problems; yet, one had frequently to summon all one's energy in order to continue working and not lose oneself in day-dreams. Life, after all, was very monotonous, in spite of music, books, films and friends; the long winter-night made itself felt, particularly now that its end was in sight. But again and again we were compensated by the splendour of the warmly glowing purple light, dissolving with the most delicate shades into the blue of the night, from which the stars glittered. On August 20th the astronomical return of the sun was celebrated, but it was not until the 26th, a cold and clear day, that it could be seen properly for the first time, just above a fog-bank on the sea, on the northern horizon. On August 30th a heavy storm, the worst so far, tore an Otter plane from its moorings; it was later found completely demolished. A magnetic storm interrupted all radio communications for many days; the meteorologists, at the Weather Central, were ill-humoured, as their charts remained empty. But in spite of everything, the sun had returned and life at the station, at all stations, received fresh impulses. It had been a very happy idea to establish for the first time an Antarctic Weather Central, and also invite the co-operation of meteorologists from other countries. José Alvarez from Argentina and Vladimir Rastorguev from the Soviet Union formed an excellent team together with the American meteorologists. At the beginning of September the first flights to McMurdo increased the compass of our world, the relief station for the flights to the South Pole was re-established, and new quarters prepared for the expected "tourists". But as yet it was far too cold for larger undertakings; as far as one could see from the edge of the barrier, the sea was frozen, and larger icebergs, distorted by mirage, seemed to float above the horizon. The condensation trail produced by the camp drifted far out over the sea; no animal enlivened the grand solitude, which was enhanced now and then by a sighing and cracking in the ice. This was no country for human beings, and sometimes one shivered.

On October 1st the first large column of sledges started with a pay-load of 150 tons for Byrd Station; with long condensation trails, the tractors disappeared on the southern horizon, accompanied by all our good wishes. The same day three planes, coming from New Zealand, had landed at McMurdo, and now it was really spring. Once more our patience was put to a hard test, for a storm-cyclone developed over the Ross Sea, the horizon disappeared in the drifting snow, and our mail, accumulated over seven long months, remained at McMurdo. In a lull of the storm three large skuas circled above the station; they were the first naturally living creatures for many months. The bad weather was unusually stubborn, and not until October 12th could a Neptune risk a flight.

It was a day like Christmas in one's childhood, everybody retiring into a corner and returning with the aid of letters to his loved ones. For a long time we could find no sleep that night; everybody was relaxed and talkative. We had withdrawn into our work for too long, and now we were suddenly and excitingly overcome by the realization that we were still in the middle of life. The new people had brought not only mail but also fresh germs, and for several days there was sneezing and coughing in the camp, something completely unknown when we were isolated. After long preparations, a small group with three snow-cats set out on October 24th for a crossing of the Ross Ice Shelf, which was to take three months. Measurements of ice thickness and snow studies on this, the largest floating glacier, were the objective of the expedition. The leader was A. P. Crary, not only an excellent scientist but also a man who by exemplary hard work and a balanced character was able to secure the respect of everybody.

For days now the sun had circled the horizon continuously, and in good weather there was much flying, supplies for the groups travelling by tractor and reconnaissance of new working fields. For the glaciologists the aeroplane provided unique possibilities, which did not replace detailed studies but allowed them to be started in the right places. The flight to Okuma Bay, where apparently many tabular icebergs had their origin, and to the Rockefeller Mountains, which break through the gently ascending ice-cap on Edward VII Peninsula, was unforgettable. So was the flight to Bay of Whales, where the geologist James Zumberge had established his Camp Michigan amidst a real chaos of crevasses and pressure ridges, in order to study the formation of anticlines in the ice shelf. Among the "tourists" who now visited our station frequently, apart from journalists, were some very interesting personalities, like Sir Hubert Wilkins, the first Antarctic airman, who, although 70 years old, was accumulating experience with new equipment enthusiastically and with judgement. Time began to pass now with increasing rapidity; the weather for radiation measurements was favourable, the next period of work at the Pole had to be prepared, and almost every plane brought mail which had to be answered. We almost regretted that occasionally we also had to sleep.

On November 28th we flew with Harvey Speed, one of the most experienced Antarctic pilots, in the *Que sera sera* to McMurdo. Our friend Paul Dalrymple, known throughout the Antarctic as "scroungy redbear", was resolved to work a further year at the South Pole. A few days' waiting passed quickly at first, the change was so agreeable, especially the aspect of the mountains around. We saw the Globemasters coming and going on cargo flights into the inland ice; at one

time four of these giant birds were assembled on the thin surface of the Sound ice. We were drawn again and again from our overcrowded camp to the New Zealand Scott Base, that model Antarctic settlement, the inhabitants of which were such extremely amiable hosts. Often we sat together in our Jamesway hut with the scientists of the summer programme, glaciologists, geologists and lichenologists, and held discussions. Those seminars within view of Mount Erebus were unique, with Bill Field and Dick Goldthwait, Linc Washburn and George Llano; for one night Paul Siple was also there, just back from the South Pole with unique experiences. Rumours came through that the ice-breakers could not manage the ice in Kainan Bay, that the *Glacier* had damaged a screw and the *Atka* had lost both its helicopters in crashes. An increasing number of those who had stayed the winter were waiting for transport to New Zealand by Globe-master, but the weather was unfavourable; again experience proved that in polar regions patience is one of the most essential virtues.

Flight to the South Pole

At last the time of waiting was at an end; on December 5th, an unpleasant grey day with slight falls of snow, the loads were stowed away in the R4D. It was "Gus" Shinn's eighth polar flight, and full of expectation we climbed into the plane, with "Blizzard", the young husky, who smelled like a fish because he had been fed on nothing but seal meat. Soon we plunged into the thick clouds and for two hours could see nothing. But just at the right moment the cloud-cover dissolved, and the mountains with high black walls rose from the expanse of the ice shelf. Through a fjord-like valley the great Nimrod Glacier thrust its masses of ice forward, then we flew along the Queen Alexandra Range. Above the black and steep walls a strongly glaciated plateau-like mountain country of soft forms stretched, from which rose sharply edged peaks with high furrowed flanks, perhaps 6500 ft. high or more; this was the group round Mount Markham, whose 15,100 ft. undoubtedly formed one of the highest and most imposing mountains of the Antarctic Continent. Then we had reached the mouth of the Beardmore Glacier, and there began an exciting hour, perhaps the most exciting of the whole Antarctic year, the flight over this, the most gigantic of all valley glaciers, 125 miles across the large horst range, up to the polar plateau. Abrupt granite mountains with sheer walls that overhung the yawning crevasses stood like guardians at the entrance to a lonely and grand world of rock and ice. Ernest Shackleton, on his memorable journey south, was the first man to see this glacier, when together with his companions J.B. Adams, E. Marshall and F. Wild, he had

ascended Mount Hope (2758 ft.) in order to obtain a better survey. He had followed the glacier hopefully, and he described the mountains aptly when he wrote of them that they "are not beautiful in the ordinary acceptance of the term, but they are magnificent in their stern and rugged grandeur". We flew directly towards the gigantic block called "Cloudmaker" (9971 ft.) by Shackleton; further to the right, above the tributary glaciers coming in from the west, rose torn ice-flanks, and shining above them stood high plateau-like peaks, among them Mount Kirkpatrick (14,824 ft.). The surface of the glacier was split by innumerable crevasses, and the plane's small shadow raced across it. We could not fail to remember how Scott and his brave companions, down there, in February 1912, had fought a desperate battle for the return to life, hungry and with frost-bitten limbs, yet pulling a heavy load of rock specimens.

Some of the high mountains were completely white, but the flanks of others had been bared by storms; there one recognized the pale-brown horizontal layers of the beacon sandstones, and between them the thin black coal seams. The immense range had been carved by erosion out of an undisturbed rock table which had been lifted up in entirety. This became increasingly apparent in the uppermost part of the glacier, which was at least 25 miles wide, where the range dissolved into individual massifs, each of them with an ideally beautiful summit-plain that was easily 10,000 ft. high, one being separated from the other by ever-widening branches of the inland ice. The ice up there was in places free from snow, and so were large parts of the rock-strata covered by moraine debris, probably on account of the wind which was particularly strong there where the terrain began to drop towards the drainage area of the glacier. We, too, came to feel the increased gustiness, for the flight, at times, became rather bumpy. Whereas to-day only small cornice glaciers hold out where sheltered from the wind, at one time these ice-free regions were also covered by ice, as one realized from the surface forms; but that must have been a long time ago, because we know that on the rock, down to the present snow level, there are lichens which in this rough climate must surely have taken a long time to colonize. The level of the ice surface has certainly not sunk for a long time; in some places, where small glaciers are apparently pushing forward over the top of the main ice-stream, one has the contrary impression of an increasing glaciation.

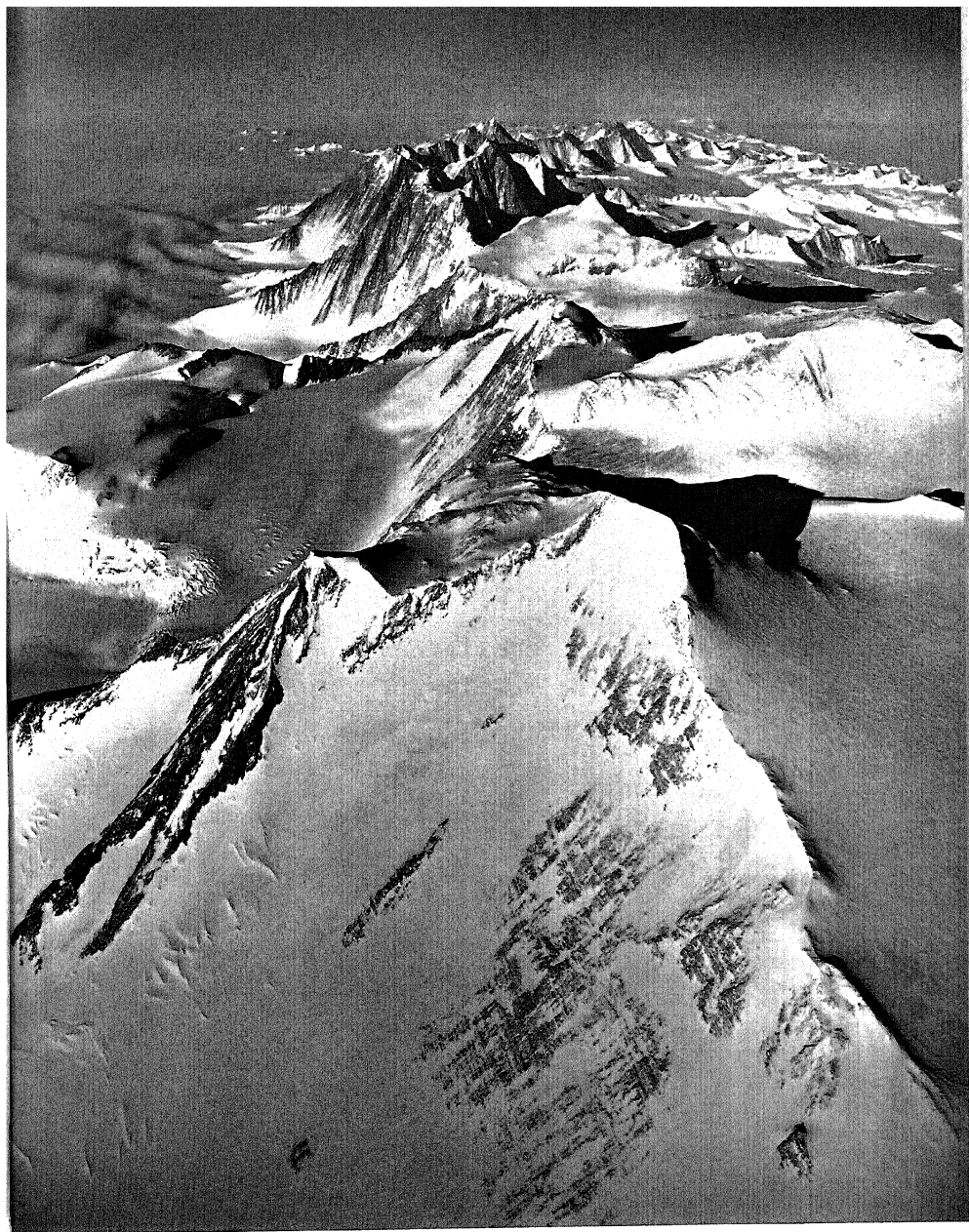
The last mountains were now behind us; a few undulations and crevasse systems in the surface of the wide snow plateau seemed to bring the drainage area of the Beardmore Glacier to an end; then only the fine marking of the Sastrugi, crossing our course at an acute angle, was still recognizable below us.

Somewhat exhausted we sank on the stacks of cases, for the great altitude and the excitement of the last hour had made themselves felt. Far to the left, on the east, a few high peaks of the Queen Maud Range rose above the horizon. Amundsen, who had chosen the steep and crevassed Axel Heiberg Glacier and the Devils Glacier for crossing this range at the end of 1911, determined the height of Mount Thorvald Nilsen as 14,750 ft. Still further east the Amundsen and Robert Scott glaciers, discovered in 1929 by L.M. Gould during the first Byrd expedition, broke through the horst range. The Robert Scott Glacier had been covered on foot by Quin Blackburn during the second Byrd expedition (1934) in its entire length of 110 miles, right up to the polar plateau. According to the descriptions by Amundsen, Gould and Blackburn, these glaciers, which come in at the southernmost corner of the Ross Ice Shelf, are, together with the Beardmore Glacier, not only the longest but presumably also the grandest ice streams on earth today. After we had been flying for two hours southwards since the last mountains had disappeared, a weasel track appeared below us, and there was the station, the huts buried deeply beneath the snow, the black rawin dome above them, and the ring of empty oil drums marking the South Pole. After a flight of almost six hours we landed and stepped somewhat dizzily onto the South Pole; a dream of one's youth had been fulfilled.

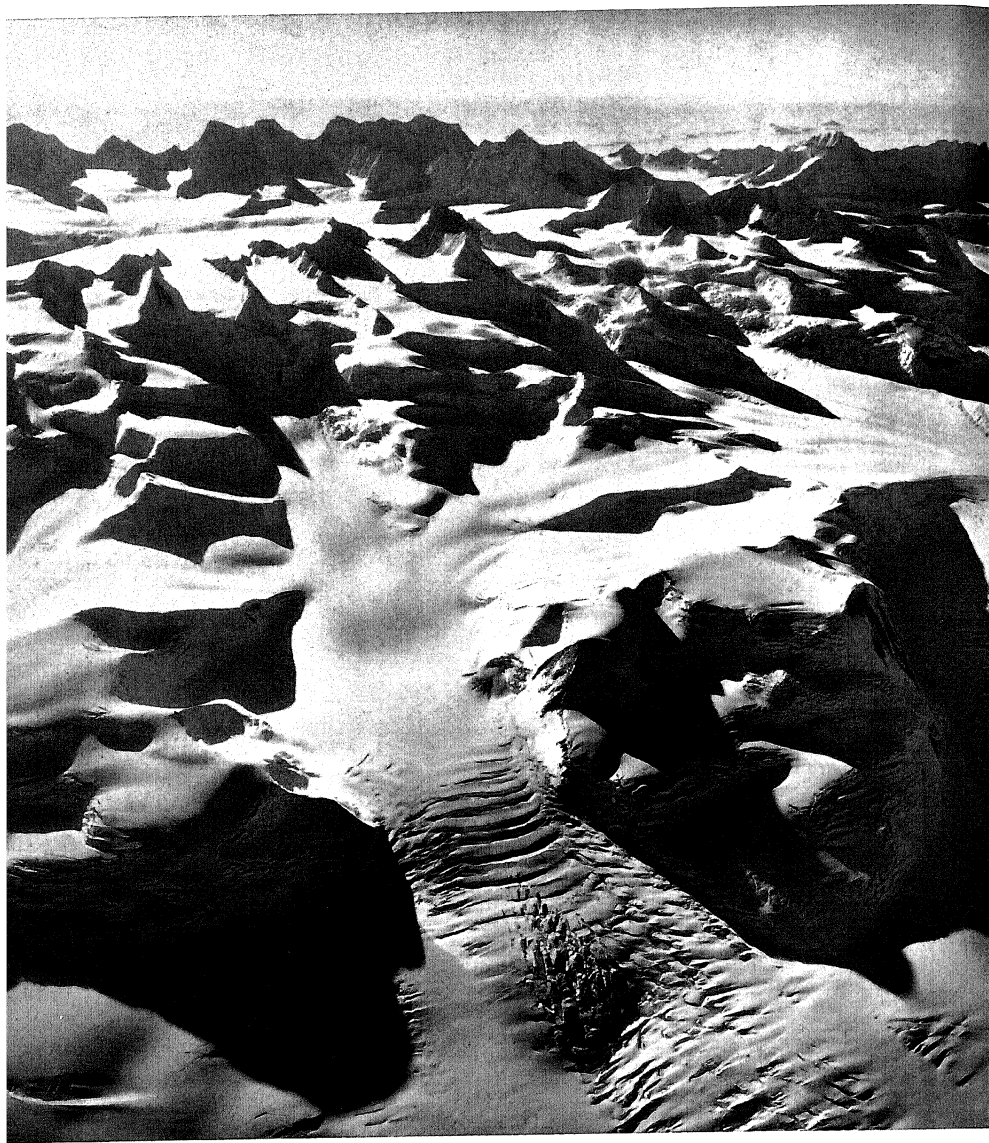
Palle Mogensen, the new head of the station, welcomed us; a cup of hot coffee did us a lot of good, because with -25° C. and wind it was rather fresh for a summer day. Shortly afterwards we witnessed the first measurement of ice thickness at the South Pole. Rev. Daniel Linehan, S. J., a noted seismologist, had put up his geophones and soon the first blast was fired. From the time taken by the shock waves to travel to the rock beneath and by the reflexion to return thence to the surface, the ice thickness could be calculated. A few days later a radio message arrived with the result. The ice thickness was 8200 ft.; with a station elevation of 9200 ft., the rock base beneath the station was thus only 1000 ft. above sea-level.¹ The ice thickness beneath the Soviet station of Vostok I was found to be 9500 ft. and beneath Komsomolskaya 11,000 ft. Similar results were obtained by the French and the Australians, with ice thicknesses varying between 6500 and 10,000 ft., the rock base lying above sea-level almost throughout.

The days at the South Pole passed quickly, with measurements of the intensity

¹ An ice thickness of only 1950 ft. was sounded by the Trans-Antarctic Expedition on January 24th, 1958, about 25 miles after leaving the polar station. Here an outlier of the horst range lay below the ice, whereas the Pole was apparently above a deep valley-basin filled with ice.



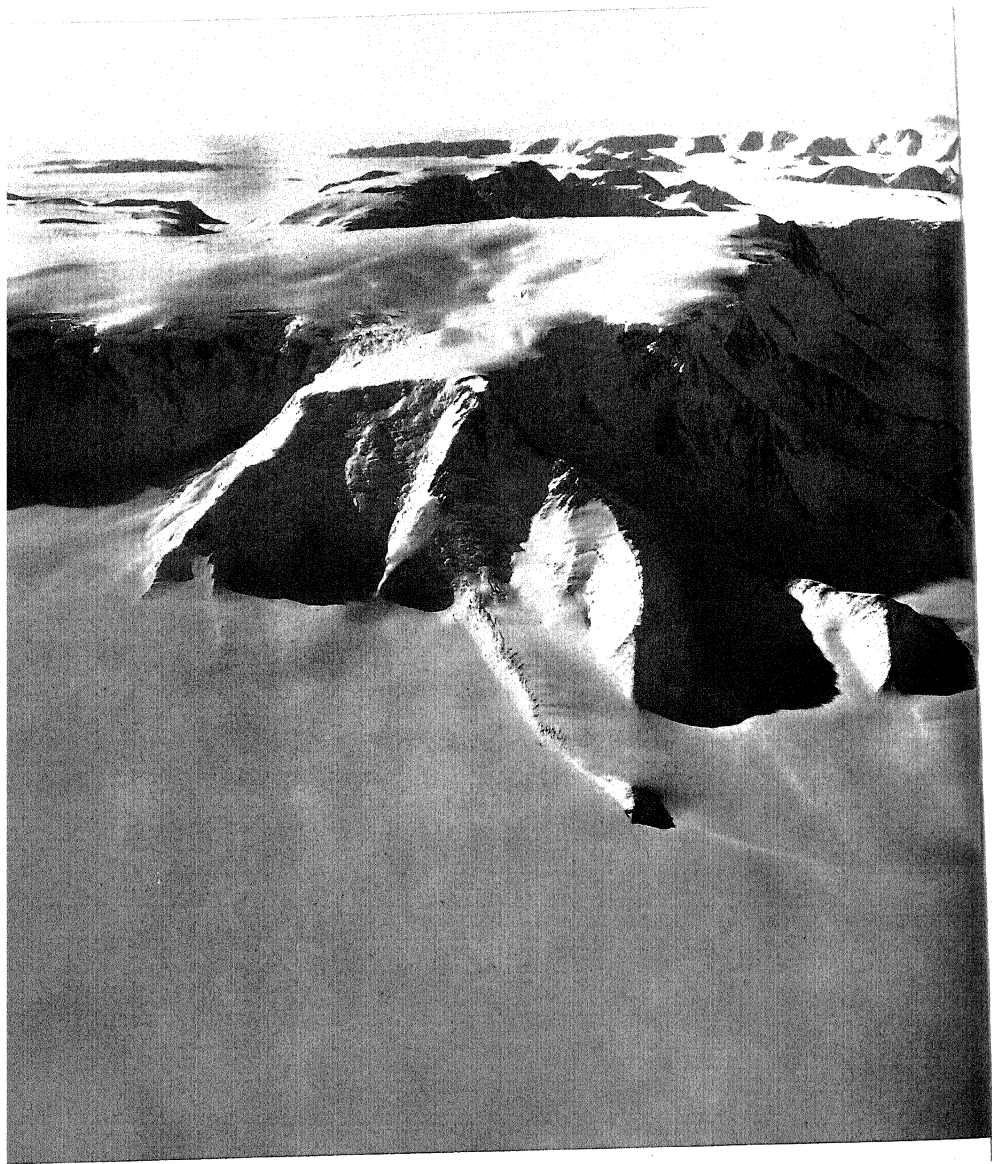
54 VIEW OF SENTINEL RANGE, looking north. This most important high-mountain range of Western Antarctica was first seen and named by Lincoln Ellsworth during his Trans-Antarctic flight of November, 1935. Along longitude 86°W , between latitudes 77° and $78^{\circ}30'\text{S}$ there are more than 70 peaks, at least five of them over 13,000 ft. (Aerial photograph taken on December 15th, 1959, by U.S. Navy for U.S. Geological Survey)



55 LOOKING WEST TOWARDS SENTINEL RANGE. Several huge heavily crevassed glacier-valleys separate the lower subsidiary ranges, which run along the eastern side of the main range. Highest peak shown in the picture reaches 13,300 ft. (Aerial photograph taken on December 15th, 1959, by U.S. Navy for U.S. Geological Survey)



56 VIEW OF SOUTHERN PART OF SENTINEL RANGE, looking south. A gigantic stream of ice flows through the mountain-ranges in the direction of the Filchner-Ice-Shelf. (Aerial photograph taken on December 15th, 1959, by U.S. Navy for U.S. Geological Survey)



57 LOOKING SOUTH OVER WESTERN HORLICK MOUNTAINS (latitude 85°S between longitudes 130° and 85°W). An imposing escarpment of over 5000 ft. forms the northern border of the mountain ranges with plateau-like summits of over 10,000 ft. Devonian Graywacke and Permo-Carboniferous sandstones with coal seams (Beacon group) are superimposed on pre-Cambrian granite. Presumably during the Tertiary period the blocks were lifted up to their present height and tilted slightly to the South. (Aerial photograph taken on January 19th, 1960, by U.S. Navy for U.S. Geological Survey)

of the sun's radiation and the reflection capacity of the snow cover. The latter was very high. On the average 90% of the sun's and the sky's radiation were reflected, and thus the snow never reached melting point; even in late summer the air temperature hardly rises above -20° C. Each year on the average 25 cm. of snow, with a water content of about 70 mm. are deposited. So although there is a desert-like aridity in the interior of Antarctica, this small amount of snow is sufficient to preserve the ice cap, as evaporation is certainly very slight and is compensated by the formation of hoar frost. In former days one tended to ascribe great importance to the hoar frost for the nourishment of the masses of inland ice, above which one assumed constantly fair weather in the "glacial anticyclones". It is true, one finds conspicuously beautiful frost crystals on the snow, flakes a few centimetres in diameter and of complicated construction, or fine needles up to 10 cm. long, or combined bunch-like formations like fine rimy plants. The greatest hoar frost crystals, however, grew where the snow had been soiled by planes starting with rocket assistance, or on slopes where the sun's rays fell with greater intensity. There a bit of the snow evaporates and at once crystallizes again; the hoar frost is therefore essentially a substance developing from the snow cover, and is not genuine growth. This takes place also over the great Antarctic inland ice, predominantly by cyclonic precipitation.

A particularly interesting arrangement at the Pole Station was the "snow mine", a shaft leading at an angle of 20° about 100 ft. under ground. This had been excavated in the course of the winter by all inhabitants of the Pole Station in order to satisfy the water demand, 1400 pints per day on the average, and to make glaciological studies possible. The bearded glaciologist of the winter team, E. Remington, was still at the station; we often climbed down into the pit to dig up our own water supply and to discuss his studies. Snow specimens from different levels were cut into thin slabs and photographed with the light shining through them, in order to study the grain size and thus the question of how the snow is transformed into ice without melting. From a depth of 30 ft. onwards, a constant temperature of -50° C., the annual mean temperature at the South Pole, prevailed in the pit. The Amundsen-Scott Station was thus at that time the coldest inhabited place on earth; on September 17th, 1957, the lowest temperature observed up to that time on the earth's surface occurred here with -74.5° C.¹ The winter on the inland ice of the Antarctic is incredibly severe,

¹ In 1958 a still lower annual mean temperature of -55° C. was observed at the higher station of Vostok (11,220 ft.). It was also there that on August 25th, 1960, the absolute temperature minimum on the earth's surface occurred with -88.3° C.

because even with the lowest temperatures it is never calm. For instance, July 29th, 1957, had a daily mean temperature of -70° C. and a wind velocity of 19 m. p. h., which was close to the limit of what men can endure even with the best special clothing. Even months with a mean temperature of below -60° C. had average wind velocities from 15 to 19 m. p. h.; on 169 consecutive days, from May 28th to November 12th, 1957, the temperature never rose above -40° C. Now, in late summer, the temperature was much higher, varying between -20° and -30° C., a temperature range to which we had become well accustomed and which we thought by no means unpleasant.

On December 13th, with a risky landing out of the fog, a plane reached us, which, apart from a few newspapermen, also brought Father Darkowski from McMurdo with a real Christmas tree and the Christmas mail. But in the continuous blinding brightness hardly any Christmas spirit had yet awakened in us. On December 15th, in the course of a small ceremony, the flag of the United Nations was hoisted beside that of the United States. One could not have thought of a better place for this symbol of understanding between all nations than this converging point of the meridians! At midday the machine rose again into the air enveloped in the smoke of its J.A.T.O. rockets (Jet-Assisted Take-Off), without which a plane could not start in the thin polar air on the cold soft snow. To nurse our homesickness we sang Christmas songs in our leisure time; even though our dog, in its urge for occupation, had unfortunately damaged the Christmas tree. Christmas Eve was very pleasant, and Bach's Christmas Oratorio had a special sound here at the end of the world.

Paul's wind mast was put up again; the first measurements of vertical wind profiles gave good results. Ron Viets, in charge of geomagnetic research at Little America, came for a few days in order to make comparative measurements. Every favourable moment was used for measuring the radiation permeability of the snow and for taking snow profiles; the time for work at the Pole could not be long now. On one occasion an unaccustomed noise, like a faraway explosion, caused us to stop work and listen. It must have been a "snowquake" like what has been described in Greenland, caused by the sudden collapse of loose layers of snow over a wide area. The seismograph also recorded a tremor; but real earthquakes hardly ever occur on the Antarctic Continent. Again and again we were thrilled by the magnificent halo appearances in the fine ice clouds. There was, in fact, so much to observe...

On December 30th we waited in vain for the British plane which had started from South Ice in order to fly across the Pole to Scott Base. Later we learnt that

low clouds and icing-up had forced the one-engined Otter to return. Not until the night of January 7th, 1958, did John Lewis, Gordon Haslop, Taffy Williams and Peter Weston succeed in this bold flight across the Antarctic Continent in 11 hours. On January 4th, a brilliantly beautiful day, everybody gathered at the two flags at the Pole in order to witness the arrival of the New Zealand group of the Trans-Antarctic Expedition, which according to radio messages was to take place at midday. At 12 o'clock a black point appeared on the horizon, but it was another hour before one could recognize the three small Ferguson tractors, which were linked by thick ropes because of the danger of crashing into a crevasse. Then Sir Edmund Hillary climbed out of the first tractor and his four companions from the other vehicles; cameras clicked, hands were shaken, and there was great enthusiasm all round. It was the first expedition since Scott's to reach the South Pole by surface transport; it was only regretted that Dr. Vivian Fuchs, delayed by crevasses on the other side, stood only at 85° south and would not be able to reach the Pole the same day. All of us, who remember with gladness the pure atmosphere of that day and the pleasant and brave New Zealanders, later regretted that the newspapers thought it necessary or right to invent a "race" for the Pole and serious differences between Fuchs and Hillary.

The following day two planes arrived with a group of physiologists, who handed everybody mysterious-looking bottles and proceeded to take "mouth washes", happy to have so many new victims; they also came for the Hillary group. The last measurements were concluded, the instruments were packed, and after a quick farewell from the men who were to face a lonely and hard winter there, the P2V slid over the snow, the Jatos thundered, and with huge acceleration we were shot into the air. The Pole Station vanished in the ice haze, in which a splendid reflection of the sun soon appeared. Quicker than we thought, the first nunataks were there, and above the mountains silvery shining wave clouds stood; then began the brightly polished sheets of ice and the large crevasses of the Beardmore Glacier. Once more we experienced that thrilling flight; all the mountains were free and rose sharply and splendidly from the ice falls. It would have been wonderful to have had an exact map of this glacier and to know more about its behaviour. Here there was still much work for generations of scientists and later also for mountaineers. Then we were above the Ross Ice Shelf, and yet for a long time the horst range accompanied us on the west, growing ever more distant and smaller, until ahead of us Mount Erebus emerged on the northern horizon. A low shimmering fog-bank lay on the ice shelf, dammed up by the Hut Point Peninsula and drifting in a long plume across the

Sound Ice and the air strip. The Sound was still frozen far out, but ships lay in a long channel opened up by the ice-breakers, and tractors with cargo sledges were on their way to McMurdo Station. At two o'clock at night, after having circled for a while, the pilot decided on landing immediately beside the ships. The machine bounced a few times over humps and came to a stop; we climbed out into the bright sunshine and right into the bustle of unloading.

Moraines and Shelf Ice

Linc Washburn was awaiting us with a weasel and we moved into the same hut. It was still uncertain when there would be an opportunity for flying to Little America. But again time did not seem long, as Troy Péwé, glacio-geologist at the University of Alaska, gave a deeply interesting report on his work in the large ice-free regions in Victoria Land, on the west side of the Sound. In these regions, today as dry as a desert, there was the best hope for finding moraines, which are so rare in the Antarctic because the ice-shield at the time of its greatest expansion had almost everywhere extended into the sea. The scientists were flown in Navy helicopters to those spots which, according to aerial photos, promised interesting information. Only in this way was it possible to study a large area within a short summer. Traces of four larger glaciations were found, the oldest of which indicated an ice level of about 2000 ft. above the present sea-level. The first distinct moraines were found about a 1000 ft. above sea-level; the boulders were polished by the wind and strongly weathered, another indication of very great age. Closer to the present glacier ends lay another and better preserved wall, and at a distance of only a few hundred yards in front of the glaciers the most recent moraines were found, still containing ice. In these moraines were also dried algae from former pools of meltwater, the age of which was determined by the radio-carbon method at about 6000 years. Since that time the glaciers have apparently remained unchanged, as one nowhere finds the moraines of the 17th or the 19th century that characterize the fronts of our Alpine glaciers. Photos taken during Scott's second expedition in 1912, and from the Gaussberg Region during von Drygalski's expedition in 1902, showed no change over the previous 50 years. This agreed well with our measurements of the heat budget, which in respect of the present climate showed no surplus energy available for melting. This would only change if an increased soiling of the glaciers should considerably reduce their capacity to reflect radiation. But for this the snow-free areas, which today occupy only one thousandth of the continent, would have to expand considerably. For the time being it remains completely

obscure whether the indications found of four high levels of the Antarctic ice comprise the whole period of the Pleistocene or only a later part of it. It is also unknown whether they correspond to simultaneous high ice-levels in other parts of the world, in North America or Europe. We cannot even say with certainty whether the Antarctic ice mass expands or shrinks, when the climate of the earth grows warmer. The dimensions are too great, and the influence of individual factors is still too difficult to estimate; once again a discussion ends with a confession of ignorance.¹

In the afternoon a plane came back from Victoria Land, where it had put down a group of glaciologists for a measurement of the thickness of the inland ice; before picking them up again, the pilot had time to fly us to Little America. The station had changed a lot during six weeks; new huts had been built, new tractors drove around, and almost all the faces were new, but somehow we still felt almost at home. The international character of the I.G.Y. Weather Central seemed even more pronounced by the presence of colleagues from France, Australia and South Africa; of the meteorologists of the last winter only Vladimir remained, with Ron Taylor, who had forgone an early return in order to look after my radiation instruments. We had to catch up on many observations, but again and again we made plans for the return journey, which sounded by no means as hopelessly utopian as during the winter night. Particularly stimulating was a radio message from Dr. Wexler inquiring whether on the way home I would like to visit the observatory below the summit of Mauna Loa on Hawaii where measurements of the sun's radiation had been carried out during the I.G.Y.

But we were still in Antarctica. A further radio message reported that Crary and his snow-cats had run into a badly-crevassed area on the Ross Ice Shelf, at 84° south. Although grey clouds hung low in the sky, a reconnaissance flight was at once undertaken. For three hours we flew almost exactly along Amundsen's course southwards, then ground visibility opened up; soon the tracks were found, and there was also the group working at a sledge that had broken through. Radio communication was established, then we flew systematically up and down the area with the stop watch, reporting to the ground group after each return. The large crevasses were bridged over with snow and not easily recognizable even from the air, but we managed to find a comparatively good route. Then we took

¹ The mass balance of the Antarctic ice was carefully studied during the I.G.Y. and the I.G.C. Results of independent investigations showed a positive mass balance at present. This important result supports the theory of growth of the Antarctic ice mass in periods of climatic warming.

course to the north-west, where the central region of this crevassed zone was, which so far no map recorded. The surface of the ice-table, which here was everywhere afloat, was dreadfully broken up for a distance of over 40 miles; pressures and shearing seemed to be working simultaneously. The more one learnt and saw of this huge floating glacier, the more mysterious it seemed. Its size is roughly comparable to that of France, but it is only from 800 to 2300 ft. thick, and therefore rather like a sheet of paper. Its whole area is a region of accumulation; at Little America we had found a snow growth of roughly 58 cm. (1 ft. 11 ins.) snow, with a water equivalent of 200 mm. (8 ins.); Crary's expedition would provide further data. To this was added the ice masses of the large glaciers, coming in at its southern part, and the wide stream of ice from Western Antarctica. If our figures regarding accumulation and movement were correct, then one had to conclude that of this ice nothing reached the 500 mile-long north front, the "Barrier"; that on the contrary the largest part of the Ross Ice Shelf lives entirely according to its own laws as a floating glacier. The snow deposited on its surface must be compensated by the breaking away of tabular icebergs; if this process is not sufficient, melting by sea currents on the lower side must establish the equilibrium in which the Ross Ice Shelf apparently finds itself.

The flight had lasted almost eight hours and we had seen nothing but the white plain beneath the blue sky, splendid in its featureless expanse. Then the familiar mountains approached quickly, with small cumuli above the shining peaks; we landed for a short visit at McMurdo. Soon we were again on our way; Mount Erebus sank for the last time below the horizon, and for two hours we were accompanied on the south by the glaringly white ice table, which dropped abruptly into the violet-black sea to the north. Then a low cloud cover closed, and on its shimmering upper side a triple glory appeared round the shadow of our plane. We left the blinding light and plunged into the somewhat uncanny darkness of the clouds, until suddenly the black sea, covered with rugged ice-floes, lay just below us; soon Kainan Bay appeared, the station rushed past, and in a shower of snow the machine landed.

A few days later we flew once more to Crary's group, who had managed to find its way out of the crevasse zone but now needed petrol. The cloud cover above the southern part of the Ross Ice Shelf remained closed, bounded on the south by the high Prince Olav Mountains, with the dominating Mount Wade (15,000 ft.) between the Shackleton and the Liv Glacier. A long time we searched in vain, flying below the clouds, just above the snow, and then we climbed into the sunshine once more to take fresh bearings. At last we succeeded in finding the

group between streaks of fog which reached almost down to the snow. Hugh Bennett had just laid out the geophones for a seismic measurement of the depth of ice, Walter Boyd sat in his deep snow pit and studied the stratification, Albert Crary, here reminding us more than ever of a polar bear, plodded over to greet us. They all looked sun-burnt and were in a happy frame of mind, although their work was painstaking and monotonous. A few measurements of reflection capacity of the snow cover were obtained, with much to talk about in between. All too quickly the petrol was pumped into the snow-cats and the machine was ready for take-off. The snow was so soft that we used Jatos for getting into the air; but before we were up the drifting fog had swallowed the lonely men. After completing their work at this station they would drive on for 30 miles and spend another day in studying the properties of the ice shelf; that would be repeated until the planned course of 1400 miles was accomplished. But scientific work has always been of a laborious and minute nature and this will not change in the age of technical resources, which merely allow the scientist to penetrate into regions previously inaccessible.

Flight to Byrd Station

On January 20th, 1958, the second tractor train, with a pay load of 200 tons, left Little America in the direction of Marie Byrd Land; at the same time, an opportunity to fly to Byrd Station turned up. Soon after take-off we saw the column crawling across the snow; seven heavy tractors, twelve large sledges, and in front a weasel with the crevasse detector. Then the cloud cover closed in. The ground was only rarely visible, with large black crevasses in complicated systems. The wings of the R4D were slightly iced-up when we landed at Byrd Station three-and-a-half hours later; the sledge column would probably take two weeks. There was a cheerful reunion with George Toney, who had got the station through a hard winter satisfactorily. Gales with gusts of up to 82 m.p.h., which had not been expected on the inland ice, had completely blocked the station buildings; but the 30-ft. tower with the aurora observatory had stood the test well.

Not far from the station the first deep boring into the Antarctic inland ice was undertaken, one of the most interesting and most important projects of the I.G.Y. The boring was 750 ft. deep, and the bore cores brought up had a diameter of 4 inches, consisting of clear ice with enclosed air bubbles, the high pressure of which often caused the ice specimens to burst when they reached the surface. Although the boring advanced but slowly, in the very hard ice the hole

was taken to a depth of 1000 ft. In a near-by laboratory, below the surface, the bore cores were photographed against the light, examined as to grain structure, stratification and density, and then packed for dispatch to the United States. There, a thorough chemical examination would determine the content of oxygen isotope O^{18} , the variations of which make it possible to judge the age of the specimen; according to preliminary estimates, the ice at the bottom of the bore hole was about 1500 years old. The temperature of the ice sank with increasing depth, from which one may conclude that a colder climate has been preserved in the ice. Perhaps we may succeed in finding traces of volcanic ash or micro-meteorites in the bore core, which would provide a possibility of bringing the Antarctic inland ice into relationship with that of Greenland, where deep borings had been taken to depths of over 1300 ft.

Beneath Byrd Station the ice was 8200 ft. thick, but as the altitude amounted only to 4900 ft., the rock base lies 3300 ft. below sea-level. Already, on the first sledge journey from Little America to Byrd Station, greater thicknesses of ice than altitudes above sea-level had been found almost everywhere. If the ice should melt, then at best there a few islands would remain but no mainland. Once again the old question arose as to whether the Antarctic Continent was separated into two halves by a trough between Ross Sea and Weddell Sea. To solve this problem the ice thickness in Marie Byrd Land was systematically studied, and for this task a group of scientists had left Byrd Station on November 19th, 1957. Driving with three snow-cats in north-north-easterly direction at first, they had come across the volcanic Mount Takahe (11,410 ft.), then they had turned east-south-east until they saw, at about longitude 90° west, the Sentinel Range, which had been discovered from the air in November 1935 by Lincoln Ellsworth.

The machine which had brought us to the station soon started on a supply flight for the Byrd Land crossing; they were then working some 400 miles east of the station. Time passed quickly with measurements of the reflection capacity of the snow, and the flight was a complete success. For the first time the highest part of the Sentinel Range, with peaks of 15,000 ft., could be photographed free of clouds. The seismic measurements between Mount Takahe and the Sentinels disclosed ice thicknesses between 8200 and 11,500 ft., the rock base being up to 6500 ft. below the present sea-level. It thus appears likely that an arm of the sea, filled to the bottom with ice, connects the inner Ross Sea with the Bellingshausen Sea, so that, if the ice should melt, Marie Byrd Land would be separated from the western part of the Antarctic Continent as a big island with high volcanic

mountains.¹ We learned later that, on its return to Byrd Station, about 125 miles further east, the group had measured the greatest ice thickness as 13,950 ft., situated on a rock base that was 8200 ft. below sea-level. With these completely new ideas we had to make ourselves familiar. Until then, who would have thought that inland ice, originating from two mountain glaciations, was able to fill to the bottom a part of the sea over 6000 ft. deep. The coast line in this part of Western Antarctica would be completely different if the ice were to melt away. Mountainous islands, large and small, would appear in a comparatively shallow sea. On the other hand, Eastern Antarctica would probably remain almost unchanged: largely flat country, but crossed by high mountain ranges. On their way to the Pole of Inaccessibility the Soviet seismologists had found such a range, with high peaks of 10,000 ft. still covered with 2600 ft. of ice. In any case, much more ice was on the Antarctic Continent than had so far been assumed; the mean ice thickness could hardly be less than 6500 ft., and the volume about 27 million cubic kms. (6½ million cubic miles). If this mass of ice should melt and return to the hydrologic cycle, then the level of the world's oceans would rise by at least 185 ft. A study of the Antarctic ice is therefore necessary because of the worldwide consequences of any change in the ice mass.

At about this time a group of scientists was flown back to Ellsworth Station; since October 28th, these men had driven a distance of 1250 miles across the Filchner Ice Shelf, in the course of which they had found that the shelf extended much farther south than had been assumed hitherto. In size it was comparable to the Ross Ice Shelf, and at its centre a large ice-covered island was discovered. The group had also visited the Dufek Massiv (82° 34' south, 52° 32' west), on the north side of which are large ice-free areas. The mountains, up to 10,000 ft. high, form part of the Pensacola Range, which had been discovered from the air in January 1956, during the first phase of "Operation Deepfreeze".

While at Byrd Station we received the radio message that Dr. Vivian Fuchs had safely arrived at the South Pole, awaited by Sir Edmund Hillary, who, with Admiral Dufek and the inevitable crowd of newspapermen, had flown to the Pole to welcome him. One of our planes was to fly directly to the Pole in order to transport Dr. Fuchs' dog team to Scott Base. We, too, had to leave Byrd Station; the sky was clear at first, and the abominably crevasse systems on the

¹ Further seismic profiles, taken in the southern summer of 1958/59, have confirmed this result. On the other hand no connection between Ross Sea and Weddell Sea seems to exist. Our present knowledge of sub-glacial topography rather indicates that the younger ranges of the Andine folding at this point lean against the East Antarctic horst.

slope to Ross Ice Shelf could be seen far and wide. Then we plunged into thick clouds, and the rest of the flight passed without visibility. Below the clouds, too, there were no contrasts; no horizon could be seen. It was an unpleasant "white-out", and we did not feel at ease again until the black sea appeared far to the north. The flight from Byrd Station to the Pole Station had not been successful, the machine had to make an emergency landing at 83° south because of a defect in the oil ducts and in doing so had damaged a ski. As its position was known, it was no problem to reach the stranded plane; two days later all were safely back.

Return to the old World

The last days were spent in necessary comparative measurements of the radiation instruments and in safeguarding the recording against loss by transferring it to microfilm. A flight to Little America III gave another opportunity to measure the settling of the névé in the old pit. Close to the station a huge vehicle had been found some 25 ft. below the snow surface: it was the "snow-cruiser", with which Byrd, in 1939, had hoped to drive to the Pole. Its big wheels had dug into the snow and it had never functioned; yet it was the first precursor of the present heavy tractors with their heated living quarters. The development of snow vehicles has gone forward with incredible speed; the only relic of earlier days are the dogs' sledges, which to this day are superior to any tractor in difficult crevassed terrain.

Then time began to pass very fast. In a few days the tanker *Nespelen* was to bring the last supply of aviation fuel before winter set in. Packing, doing one's laundry—rather a pleasure with the new washing machines—and, in between, repeated measurements, until the ship made fast in Kainan Bay in the morning of February 3rd, 1958. Only then were the instruments dismantled and packed, after having done service for a year in the severe Antarctic climate. Everything now was hurried, and in a weasel we drove to the bay, crossing once again the large crevasse into which innumerable tons of snow had been shovelled in order to keep it passable. Of the ship only the tips of the masts projected above the barrier. The cases of instruments and the observational records, the fruits of a whole year, were carefully lowered; then I climbed down a long ladder to the deck of the ship, and the first step back into the world had been taken!

The *Nespelen* cast off from the ice edge, which, glittering splendidly in the sun, rose from the dark-green sea. We cruised for some time in the bay, awaiting the return of the doctor, who had had to take an injured man to the camp hospital.

We had been a year in a country where Nature was of breath-taking greatness and at the same time, in the words of Sir Douglas Mawson, "a world of colour, brilliant and intensely pure". Not really a land for human beings, but therefore very suitable for teaching us that unconditional mutual aid is the only basis on which men can live together. It has been one of the most precious experiences of this year that during the whole expedition not a single quarrel took place, and that helpfulness knew no national or other barriers. Never before had so much been done for science in Antarctica; nor had scientists been so free from all problems of bare survival, able to devote themselves exclusively to their scientific tasks and to pursue these even in areas which until then had been "forbidden". The prerequisite for these almost ideal working conditions had been the enormous resources and a plan worked out in detail, in the hands of energetic and responsible men. These prerequisites, according to everything I had seen in this one year, had been perfectly fulfilled, but the necessary expense in human working-power and material had been immense. When 95% of the expense goes on transport, housing, provisions and communications, that is on supporting services, and only about 5% on science, that is on the task for which everything was organized, there is a danger that organization becomes independent; expeditions "per se", however, would hardly make sense. Now all stations had been provisioned for the approaching winter; new men, full of energy, had replaced us, who had become rather tired, in order to continue the programme of the International Geophysical Year. Many exciting results were already known, others would emerge as the material we had gathered was processed. But even after the conclusion of the I.G.Y. we would still be far from knowing the nature of Antarctica. The more detailed our knowledge becomes, the more mysterious appear the connections. Thus it was only natural that it was intended to continue the exploration of Antarctica within the framework of an "International Geophysical Co-operation 1959". Probably there will never again be a time when there are no human beings in Antarctica.

Of the large ice wall only a fine line was still visible on the southern horizon, and above it stood, gleaming in the clear sky, the last midnight sun...

MOUNTAINS AND FIRST MOUNTAINEERS IN ANTARCTICA

Small and lonely, the *Nespeleu* pitched her way through the rough seas, in showers of snow and rain, accompanied by the albatrosses, those incomparable wanderers of the Antarctic Ocean. Once again we felt the strange feeling of being in no man's land. How would the World, which one had not seen for thirteen long months, look? In New Zealand it was mid-summer, with trees and flowers and women . . . But as yet one's thoughts were directed backwards, to the great experience of this "year in the Ice Age". Now, that it had come to an end, its outlines became clearer; I analysed them, so far as sea-sickness would permit me. The return journey had begun which we had often and eagerly awaited, but I was surprised that I did not feel more obviously relieved. The little adversities, the cold fingers on the instruments, were forgotten, while the year's clear outlines were impressed deeper upon one's memory. Although time during the long winter-night often passed very slowly, I never regretted the decision I made, even if it had meant a considerable sacrifice.

Now that the ship progressed irrevocably northwards, I had, after all, but one regret: that it had not been possible to climb one of the great mountains in Victoria Land. At the Pole we had made detailed plans for such an ascent, but back at McMurdo Sound the feeling of responsibility for the scientific tasks had gained the upper hand and we did not take the necessary time. Although there are in Antarctica a great number of magnificent mountains, one has the feeling that the time for the mountaineer has not yet come. Too many more important tasks are still to be solved there; there are too many things we do not yet know, and the effort of reaching Antarctica is too great. Yet there can be no doubt that the Antarctic Continent is the last great new land for the climber. The mountaineering scientist, however, is certain to have the better prospects for some time to come, now that a start has been made at making exact maps as a basis for geological and glaciological work.

Several smaller climbs, but without any mountaineering importance as yet, were made at the very beginning of the classical period of Antarctic exploration. In order to gain an insight into the topography of the country, Borchgrevink and Bernacchi had ascended the summit of Cape Adare (c. 4250 ft.) in March 1899, whilst Philippi, Vahsel and Johannsen ascended Gaussberg (1200 ft.) in March 1902. Also in March 1902 Nordenskjöld and Sobral ascended the highest point

on Snow Hill Island (c. 1000 ft.), and, on their journey south, Mount Christensen (984 ft.) on Robertson Island, on October 8th, 1902. A little later, early in January 1903, Hodgson, Ferrar and Koettlitz reached the crater of Brown Island (2822 ft.). Here, in the mountains round McMurdo Sound, a great deal of the mountaineering activity has taken place, though the motives were almost exclusively of a topographical-scientific nature.

The beginning of mountaineering in Antarctica was the ascent of Mount Erebus (13,350 ft.) on Ross Island in March 1908. It was an outstanding achievement, if one takes into consideration the altitude of the mountain, the starting point at sea level, and the late time of the year. On March 5th Prof. T.W. Edgeworth David, Douglas Mawson and A.F. Mackay, together with J.B. Adams, E. Marshall and P. Brocklehurst, had set out from Cape Royds, awaited the end of a severe gale in an intermediate camp at 8750 ft., and reached the outer edge of the huge crater summit via the steep westerly slopes on March 10th, 1908. Mountain sickness and temperatures of about -30° C., had caused considerable difficulties, but the results of the geological observations had been worth the toil. The second ascent of Mount Erebus was achieved from Cape Evans by Raymond E. Priestley, together with T. Gran, G.P. Abbott and F.J. Hooper, on December 13th, 1912, while F. Debenham and H. Dickason carried out surveying work on the upper slopes of the mountain. The summit was reached from the north, T. Gran having an unpleasant experience in the crater, when blocks of pumice and volcanic bombs suddenly came flying through the air and the sulphurous vapours of this small eruption almost rendered him unconscious. The whole undertaking lasted from the 2nd till the 16th of December.

It was not until 47 years later that the third ascent was carried out by John Harrison, W. Romanes and A. Beck of the New Zealand Geological and Survey Expedition of 1958/59, via the completely iced-up south flank. The ascent was undertaken from a base camp at 3000 ft., on skis up to 8000 ft. and then with crampons, taking 14 hours altogether to the summit, where observations were carried out for one hour. On the level bottom of the large crater yellow-brownish vapour emerged from five openings, in one of them glowing red lava could be seen. The descent took nine hours, the last 5000 ft. being an enjoyable downhill run on skis. Only one day later, on January 6th, 1959, Hugh Anderson and H. Holloway, two Americans, reached the summit from the west. This fourth ascent was supported by helicopters of the U.S. Navy.

Another group of the New Zealand Geological and Survey Expedition,

B. Alexander, J. Wilson and M. White, succeeded in the first ascent of the extinct volcano of Mount Terror (11,400 ft.) from Cape Crozier on January 6th, 1959. Together with L. Martin and H. J. Harrington, thorough survey work and geological studies were carried out in the region of Cape Crozier for a fortnight. In the course of the surveying, which could be extended far afield with the support of American helicopters, the extinct volcano of Mount Discovery (9600 ft.) was climbed on December 24th, 1958, by H. J. Harrington, J. Harrison and E. B. Fitzgerald.

Mountains of Eastern Antarctica

The splendid mountains of the Admiralty Range, discovered by James Clark Ross in 1841 at a latitude of 72° , south of Cape Adare, are still little known. The highest peaks, Mount Herschel (11,745 ft.) and Mount Sabine (over 11,800, presumably c. 13,000 ft.), rise with steep rock walls from the fissured glaciers, not far from the New Zealand-American I.G.Y. station of Cape Hallett. In January 1958 the small New Zealand Geological Survey Antarctic Expedition 1957/58 penetrated for the first time deeper into this mountain country. Two groups consisting of geologists and cartographers followed the Tucker Glacier, which is at least 100 miles long, for 75 miles into the mountains. On January 24th, 1958, H. J. Harrington, B. L. Wood, I. C. MacKellar and G. J. Lensen ascended two mountains between 8200 and 9200 ft. high, which they named Mount Shadow and Mount Midnight (72° south, $167\frac{1}{2}^{\circ}$ east). On the north there stood several prominent mountain shapes of perhaps 11,500 to 13,000 ft. high, Mount Black Prince and Mount Royalist, "...one of the greatest panoramas of unexplored and unclimbed mountains that is left in this world". Far to the west the last peaks were visible in the crystal-clear air at a distance of about 125 miles; they were reached from the west in the summer of 1959/60 by a group of American glaciologists and charting was started. The geology of this region, slates and greywacke with tertiary folding, indicates connections with Western Antarctica. The series of sandstone and dolerite of the East-Antarctic horst range, and thus the mountains with plateau summits, begin only with Mount Levick at a latitude of about 74° south.

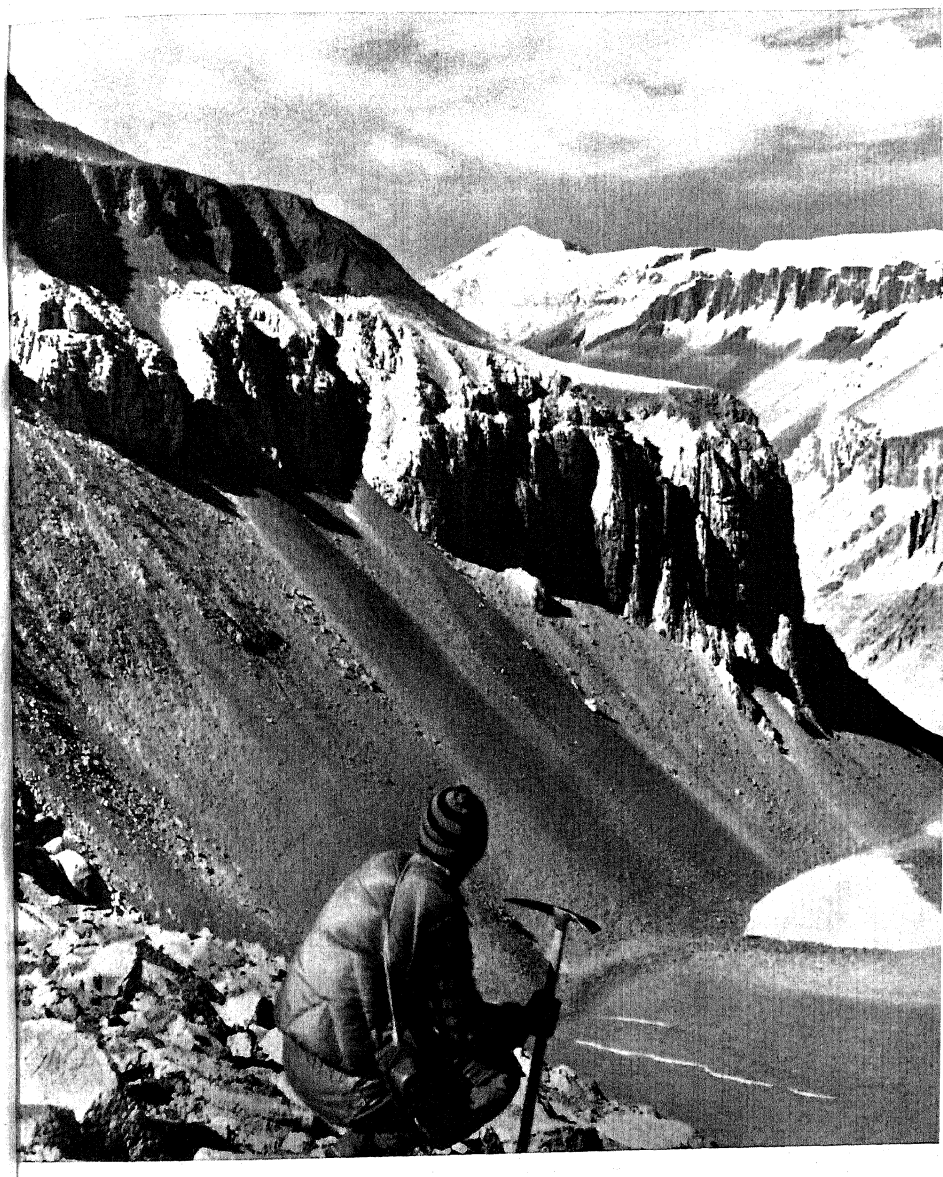
The Prince Albert Mountains, adjacent on the south, had already been crossed by David, Mackay and Mawson on their march to the magnetic South Pole in the summer of 1908/09 and been visited by the geologists of the second Scott expedition. In the course of this the prominent rock-block of Mount Suess (4000 ft.), rising from the Mackay Glacier, was climbed by T. Griffith Taylor,

Robert Forde and Tryggve Gran. A more thorough exploration of this mountain group was carried out in the summer of 1957/58 by the New Zealand group of the Trans-Antarctic Expedition, during a journey of over 1100 miles by dog sledges. During survey work in Victoria Land, between latitudes 76° and 79° south, H. Brooke, G. Warren, M.H. Douglas and B.M. Gunn climbed some 40 peaks varying in altitude between 3300 and 10,000 ft., some of which were interesting from a mountaineering viewpoint, though all provided new insight into a little known mountain world. Amongst others that were climbed were Mount Davidson (8200 ft.), north of the Mackay Glacier and the highest mountain of the group, just on 10,000 ft., which was named Tent Peak. In the near-by mountains coal seams, up to 10 ft. thick, were discovered and studied at about 76.5° south and 160° east. On the way southwards the Horseshoe Mountain (8200 ft.), in the uppermost part of the Taylor Glacier, was climbed; large leaves of *glossopteris* were found preserved in the summit rocks. Finally, the Royal Society Range, with Mount Huggins (12,870 ft.), its southern corner buttress, as the dominating mountain of the region, was reached from the west, from the drainage area of the Skelton Glacier. The ascent of Mount Huggins by F.R. Brooke and B.M. Gunn, on January 26th, 1958, is to this day the most important alpinistic achievement in Antarctica. The ascent was carried out first via the west flank, through the unusually deep and loose snow of the Trench Glacier, to an intermediate camp at 8000 ft. The breaking of a crampon in the very hard and steep flank made a diversion to the easier northern rock ridge necessary, and the summit was reached over this ridge after a climb lasting eight hours altogether. The downward view from the 8200-ft. face, in which on the east the Royal Society Range breaks off to the foothills in the direction of the McMurdo Sound, has been described by the first climbers as particularly grand. Between September 11th and 23rd, 1957, in the first cold weeks of spring, both of them had explored the whole length of the Blue Glacier, which lies immediately below the gigantic precipice. This valley would be an excellent starting point for fine climbs, not only of Mount Lister (13,353 ft.), the highest peak, but also of the only slightly lower Mount Hooker and Mount Rucker.

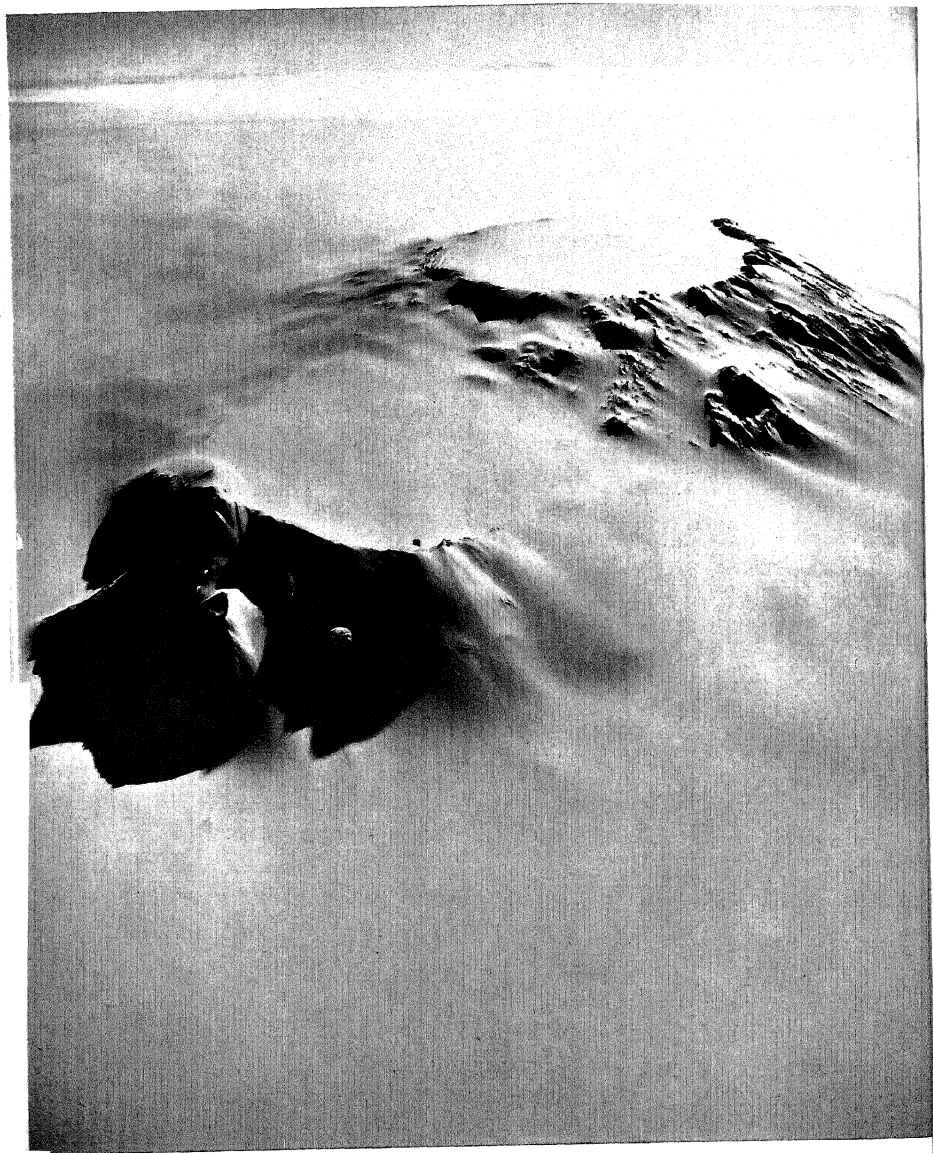
The outliers of the Royal Society Range have been visited by geologists again and again since Scott's *Discovery* Expedition, because there are surprisingly large ice-free regions here, the northward extension of which was only discovered by reconnaissance flights of Operation Highjump in 1947 and also in the years 1956 and 1957. North of the "Taylor Dry Valley", which had been known for a considerable time, and also from west to east, stretch the valley systems of the

Wright and the Victoria Dry Valley with a length of over 40 miles. In the summer of 1957/58 this interesting region was studied by several groups of American and New Zealand geologists and biologists. In the summer of 1958/59 the Victoria University of Wellington Antarctic Expedition, supported by American planes, carried out geological, geophysical and biological studies here for eight weeks. During this time the geologists Peter Webb and B. McKelvey covered a distance of 500 miles, discovering abrupt rock towers of sandstone and dolerite on granite bases and climbing several mountains. Colin Bull, the leader of this small successful university expedition, carried out in the well-tried English style, wrote that "fascinating is certainly the right word to use about the area". As a result of the strong absorption of the sun's rays on the ice-free rock, a milder climate has developed quite locally; the mean temperature in the period from December 12th, 1958, to the end of January 1959 was about 0° C., the minimum only -6° C. There are streams of melting water, the longest 25 miles long, which flow into lakes that are sometimes ice-free. The lakes have no outlet and the streams flow inland, fed by the melt water of the Wilson Piedmont Glacier, which seals off the higher-lying valley exits. Because of the desert-like dryness of the region no snow-cover forms in winter, and the lichens were found by the biologist Dick Barwick to be restricted to altitudes above 3000 ft. Everything points to the fact that these valleys have been free from ice for a very long time. In the summer of 1959/60 the exploration of these dry valleys was continued by a second expedition from the Victoria University of Wellington, with five scientists taking part.

A very important ascent was carried out by the New Zealand geologists A. J. Heine, B. M. Gunn and G. Warren on February 10th, 1957, on the west side of the Skelton Glacier, when they succeeded in reaching the summit of Mount Harmsworth (9124 ft.) in the Worcester Range (79° south, 161° east). The ascent over the steep and exposed east ridge took 16 hours, and the descent over the south flank 8 hours. As is frequently the case in the clear air of the Antarctic, the horizontal distances had been underestimated. This happened during the reconnaissance of the Skelton Glacier; the next summer, when the interior could be reached by this route, H. H. Ayres and R. A. Carlyon were dispatched with two dog sledges at the "Depot 480" (80° south, 148° east) into the region of the Britannia Range (80° south, 155° east) for survey work. Several unnamed mountains of over 8200 ft. were climbed, as well as those already marked in the maps Mount Longhurst (9200 ft.) on December 23rd, 1957, and Mount Henderson (9120 ft.) on January 8th, 1958. Finally, the large and crevassed



58 LOOKING EAST FROM SUMMIT OF MT. DAIS ($77^{\circ}30'S$, $161^{\circ}E$) into Wright Dry Valley, Victoria Land. The glaciers shrunk thousands of years ago. Due to absorption of solar radiation by areas free of snow and ice a milder climate develops locally, enabling scientific studies and mountaineering to be carried out under easier conditions than anywhere else in Antarctica. Rocks are mostly Beacon Sandstone with intrusions of Granite and Dolerite, overlying a pre-Cambrian metamorphic foundation. (Photograph by B.C. McKelvey, Victoria University of Wellington Antarctic Expedition 1958/59)



59 TWO EXTINCT VOLCANOES (10,857 ft. upper right and 9808 ft. lower left) in the Executive Committee Range, Marie Byrd Land, view east. The range consists of several ice-covered volcanoes, the highest of which, Mt. Sidley, reaches 13,671 ft. (Aerial photograph taken on January 6th, 1960, by U.S. Navy for U.S. Geological Survey)

Darwin Glacier was covered in its whole length on the descent to the Ross Ice Shelf.

At "Depot 700" (83° south, 146° east) the remaining two dog sledges, with J.H. Miller and G.W. Marsh, separated from Hillary's tractors in order to carry out survey work in the region of the Queen Alexandra Range, between the Nimrod and the Beardmore Glacier. A new mountain range west of that which includes Mount Markham (15,100 ft.) was discovered, and at the end of December two summits of about 10,000 ft. were climbed in this "Western Range". Travelling farther east, a pass in the Markham Range was reached early in January 1958, and on the 5th an excellent view into this grand part of the horst range was gained from the Col Peak (c. 10,500 ft.). Four hours of surveying in clear weather in an unknown area, determining the sun's altitude, and taking photographs "made this day one of the most valuable and certainly the most enjoyable of the whole journey". The great mountains on the west side of the Beardmore Glacier, Mount Adams (11,800 ft.), Mount Elizabeth (10,800 ft.), and Mount Kirkpatrick (14,824 ft.), could be seen for the first time from the west. The extremely successful and, with 1675 miles, unusually long journey with dog sledges, in the course of which 40,000 sq. km. of new mountain country had been explored geologically and topographically, ended at Scott Base on February 23rd, 1958, after 132 days. It was those lesser known topographical studies which secured for the "Commonwealth Trans-Antarctic Expedition" a great part of its place as one of the most outstanding undertakings during the I.G.Y.

The Commonwealth Range, which flanks the Beardmore Glacier on the east, had been selected by the New Zealand Alpine Club Antarctic Expedition as its working field for the summer of 1959/60.

The expedition was financed by the New Zealand Alpine Club and directed by R. W. Cawley; among its members were C. B. Biscoe (botanist), R. L. Oliver (geologist) and R. M. Bolt (surveyor); also N. C. Cooper, B. J. McGlinchy, P. L. M. Bain and B. L. Smith.

At the end of November the group went in American planes from McMurdo to the mouth of the Beardmore Glacier. During the first half of December the vicinity of Mount Kyffin, the eastern guardian of the mouth of the Beardmore Glacier, was explored geologically, topographically and botanically. On December 4th, 1959, Mount Kyffin (5450 ft.), whose almost vertical granite walls rise over 4300 ft. above the fissured ice of the Beardmore Glacier, were climbed and in the same area Mount Harcourt and Mount Scott also. Later, two groups explored the Hood Glacier (so named by Shackleton) which joins the Beardmore Glacier

from the east, south of a latitude of 84° . The surveying with phototheodolites was extended also to higher summits, among them Wedge Peak (over 7000 ft.) and Mount Patrick (7600 ft.); 3000 sq. km. of unknown territory were charted. The predominant rock, greywacke with granite intrusions, suggests a close relationship with Marie Byrd Land in Western Antarctica. The Beacon sandstones began only south of the working field. The large number of lichens and algae was surprising and so was the finding of a moss at a latitude of 84° south, in addition to some invertebrates, mites and worms, for which no habitat so far south was known. At the beginning of January 1960 the successful expedition was flown back to McMurdo by New Zealand planes.

Of the mountains of Queen Maud Range, adjacent on the south-east, we know something from Amundsen's descriptions of fissured glaciers (Axel Heiberg and Liv Glacier) and many high mountains (Mount Fridtjof Nansen, 13,450 ft.; Mount Don Pedro Christophersen, 12,874 ft.). R.E. Byrd had flown over this grand region in 1929 and discovered Mount Wade (15,000 ft.); it was during this expedition that the first attempt at a mountain ascent was undertaken. The scientists, travelling with dogs' sledges under the leadership of the geologist Laurence M. Gould, reached an altitude of about 8850 ft. on Mount Fridtjof Nansen; here, too, the Beacon sandstones, typical of the horst range, were found, with some negligible coal seams and dolerite intrusions. Of the lower outliers the "Supporting Party Mountain" ($85^{\circ} 30'$ south, 148° west, 1300 ft.) was ascended on December 21st and on Christmas Day 1929 Mount Betty (1250 ft.), on the summit of which the cairn which had been erected there by Amundsen 18 years before was found. During the second Byrd expedition Russell, Blackburn and Paine carried out a journey to these mountains by dog sledges, over a distance of more than 1450 miles. Across the Ross Ice Shelf they drove to its southernmost corner, then decided to follow the still unknown Robert Scott Glacier (at that time called Thorne Glacier). It was 15 to 20 miles wide at its mouth and extended for more than 100 miles to the Polar Plateau, at first between bold granite needles, and flanked higher up by massive mountain blocks. In its uppermost part, Mount Weaver (10,000 ft.) was climbed on December 10th, 1934, in a severe storm; in its stratified rock flanks a rich yield was found of coal, leaf impressions and petrified trees, only 200 miles from the South Pole! To the west the summits named already by Amundsen were recognizable, but on the east the range continued in the direction where, a few days earlier, the reconnaissance plane *Horlick* had reported "high mountains on the south" from the point at which it had turned back at 83° south and 119° west.

These Horlick Mountains, discovered in 1934 and crossed by plane in 1947, during Operation Highjump, were visited by American scientists in December 1958; these had laid a seismic profile from Byrd Station to the south. The mountains extend as massive blocks with plateau summits at a latitude of 85° south between 130° and 85° west, with an imposing steep escarpment on the north. A mountain with a beautifully stratified rock flank, at 114° west and 85° south, was climbed by C. Bentley, J. Long, W. Long and F. Darling on December 6th, 1958. The expectations of the geologists were fulfilled in such a high degree that the name of Mount Glossopteris was proposed for the mountain, which is approximately 10,000 ft. high.

In January 1956 airmen of the American Navy had discovered and photographed adjoining mountain ranges, extending between latitudes of 85° and 83° in the direction of the Weddell Sea. The north-easternmost massif of this Pensacola Range was visited in December 1957 by American scientists during the crossing of the Filchner Ice Shelf, and was named Dufek Massif. The mountains extended for over 25 miles between 50° and 54° west, at a latitude of 82.5° south. In the higher south-western part of the group the summits attained about 10,000 ft., the shapes were high-alpine, with sharp and pinnacled ridges. Geological examination disclosed an undisturbed basic complex of igneous rocks, predominantly gabbro; in the lower north-eastern part were a few dry valleys with patterned ground, one of which contained a small tarn of melt water with algae. In the course of the geological work several smaller rock peaks, partly very difficult climbing, were scaled by John C. Behrendt, Edward Thiel, Paul Walker and Hugo Neuburg. John Behrendt wrote: "The rock is very firm and rough; in short, this would be an ideal climbing area if it were accessible."

The north-eastern continuation of these mountains was discovered by the Commonwealth Trans-Antarctic Expedition. On February 6th, 1956, Sir Vivian Fuchs, with John Lewis, on a reconnaissance flight south-eastwards from Shackleton, sighted the Theron Mountains for the first time, at about 79° south and 30° east (Mount Faraway, *c.* 4600 ft.), the easy summits of which were later ascended during geological studies. These mountains consist chiefly of chalky and clayey sediments, with some coal deposits. About 60 miles to the south, at a latitude of 80.5° , the hoped-for easy ascent to the plateau was prevented by the more extensive Shackleton Range, the rounded summits of which, around 4900 ft., were also mostly ascended. On January 10th, 1957, Sir Vivian Fuchs carried out a reconnaissance flight from Halley Bay to the east, in the course of which the Tottan Mountains, about 200 miles inland from the Caird Coast and

up to 9200 ft. high, were discovered. Thus, the link had been established with the mountains already known in Queen Maud Land, which appear to be connected by an almost uninterrupted chain of high ranges, over a distance of 2500 miles, with the Admiralty Range in northern Victoria Land—undoubtedly one of the most distinct features of the earth's surface.

The mountains in western Queen Maud Land were studied by the Norwegian-British-Swedish Antarctic Expedition 1949-52. Level sandstones, greywackes and conglomerates, with volcanic intrusions, predominate, which are broken up into separate mountain blocks. Steep rock walls of 3300 ft. rise from the ice to plateau-like summits of 8850 ft. East of the Greenwich meridian the metamorphic gneisses and slates of the pre-Cambrian base of Eastern Antarctica are more pronounced. Also running from south-west to north-east, they form a mountain range with peaks of up to 9120 ft., which serve as a dam for the inland ice behind it. A huge glacier, 95 miles long and 30 miles wide, breaks through this dam at about the Greenwich meridian. In its upper part, at 73° south, the rock base was found to lie far below sea-level; it is a fjord-like valley, completely filled with ice. According to C. Swithinbank, "the predominance of the ice cover is without doubt the most striking feature of the landscape of Western Dronning Maud Land". Neither are there any signs of a decrease in the ice in the last few decades, but on the other hand, as everywhere in the Antarctic, very ancient traces of an ice-level up to 2600 ft. higher.

From the Greenwich meridian high and splendid mountain ranges extend along the coast for at least 600 miles, about as far as 30° east. A part of them, the Mühlig-Hofmann and the Wohlthat Mountains, about as far as 20° east, were charted from the air by the German *Schwabenland* expedition of 1939. The summits reached 10,000 ft., the shapes are high-alpine, with sharp ridges and bold rock pinnacles. As the land was untrodden, little can be said about its geology. Presumably there are here, too, the crystalline base range with at least partly preserved covers of sandstone, permeated by volcanic rocks. Since March 1959 the Soviet station of Lazarev has stood at 70° south and 13° east, and from it the exploration of this important mountain country has undoubtedly already begun. Between 20° and 30° east rise the Sør-Rondane Mountains, which were charted by the Lars Christensen Expedition of 1937 and ten years later from the air by Highjump planes. The Belgica Mountains were discovered in 1958 130 km. south-east of the eastern end of Sør-Rondane Mountains. In Enderby Land, further east, the highest peak in the Napier Mountains was stated to be 7400 ft.

South of Mawson Station the Australian National Antarctic Research Ex-

pedition has begun since 1955 to explore systematically a new high range, which has been given the name of Prince Charles Mountains. Its northern parts were probably sighted for the first time by airmen of Operation Highjump; it extends between 62° and 68° east at least as far as 74° south. The highest peaks, at a latitude of 71° , rise up to 8200 ft., Mount Menzies at 73.5° is 11,000 ft. high. On December 8th, 1958, a Soviet plane discovered at $75^{\circ} 14'$ south and $61^{\circ} 08'$ east a pyramidal mountain of 10,800 ft. and at 74° south a mountain group with 17 peaks; these apparently form the southern continuation of the Prince Charles Mountains. In the course of the geological survey, most peaks of the Framnes Mountains, near the coast, were ascended; Mount Henderson (3600 ft.), discovered by Sir Douglas Mawson in 1930, was climbed on February 24th, 1955, by P. G. Law, J. M. Béchervaise, P. J. Shaw and A. W. Hall. In the central part of the Prince Charles Mountains, too, several peaks were climbed, which consisted chiefly of gneiss and granite. Here, too, larger areas of level Permian sandstones with thin seams of coal were found, which were given the name "Amery Formation". The two highest mountains climbed were Mount Bewsher (8290 ft.), with a flattened summit, and Mount Hollingshead (7600 ft.). On all these mountains traces of a much older glaciation, up to 1000 ft. above the present ice-level, were ascertained. On October 12th, 1956, John Seaton discovered during a reconnaissance flight a gigantic glacier, which, coming from a latitude of 74° , joins the Amery Ice Shelf at 71° , along longitude 68° east. With a length of over 185 miles, this Lambert Glacier should be the longest ice stream known. According to the pictures and maps now accessible, the mountains flanking it are low and without mountaineering interest, so that the Lambert Glacier can hardly be compared with the unique ice streams in the southern part of the Ross Ice Shelf.

Mountains in Western Antarctica

The coast of Western Antarctica, east of the Ross Ice Shelf, was seen for the first time by Scott in 1902 and named Edward VII Land. In December 1911 the eastern group of Amundsen's expedition carried out a sledge journey into this region, in the course of which Christian Prestrud with two companions ascended the summit of the Scott-Nunatak (1700 ft.). During the first Byrd expedition in 1929 the Rockefeller Mountains were discovered here from the air, and at 145° west the Edsel Ford Range. During the second, and especially during the third Byrd expedition, this new mountain country was geologically explored from Little America; strongly folded crystalline sediments, with intrusions of granite,

form pyramidal summits, with altitudes below 5000 ft. During the geological and survey work about 60 peaks were ascended, of which only a few might be of interest to the mountaineer. The summits of Mount Franklin and Mount Helen Washington, in the Rockefeller Mountains, were even reached with a tractor in February 1947. Further east, and south-west of the Getz Ice Shelf, the Hal Flood Range rises to an altitude of more than 6500 ft. In this region a new mountain range with peaks of over 10,000 ft. (Mount Sidley, 13,670 ft.) was discovered on December 15th., 1940 and named "Executive Committee Range". During a reconnaissance flight of Operation Highjump in February 1947, a still higher mountain was seen here, the altitude of which was estimated by some observers as "more than 14,000 ft.", by others at "about 19,500 ft.". This mysterious mountain has since been looked upon as the highest mountain in Antarctica.

At the beginning of March 1959 John Pirrit carried out a crossing from Byrd Station to the Executive Committee Range. Between 77° 20' and 76° 20' south, at longitude 126° west, ten peaks between 7200 and 13,700 ft. were surveyed; they were strongly glaciated and consisted of basalt and volcanic breccia. The legendary mountain of nearly 20,000 ft., referred to above, could not be found. South of the Amundsen Sea R.E. Byrd sighted the Kohler Range in February 1940, the highest summit of which was first estimated, on a flight on January 26th, 1947, at 17,700 ft.; this was later reduced to 14,800 ft. In the same region the Marie Byrd Land crossing in the summer of 1957/58 surveyed the altitude of the Cray Range from the slopes of the extinct volcano, Mount Takahe (11,410 ft.), and made it 12,365 ft.; the height of the Toney Range was reckoned to be 12,170 ft.; higher peaks have not yet been confirmed. These mountains, too, are of volcanic origin. According to the results of seismic measurements of ice thickness, all mountains in Marie Byrd Land stand on a large island which is separated by an arm of the sea, filled to the bottom with ice, from the western part of the Antarctic Continent. The latter presumably contracts to a comparatively narrow strip of mountainous country, which runs from Graham Land (Palmer Peninsula on American maps) at first south-west, turning south at a latitude of 77° and linking up, under the ice, with the Horlick Mountains at about 90° west. The last peak, at 82° south and 89° west, rising only a few hundred feet from the inland ice, was surveyed at 7500 ft. by the Ellsworth-Byrd crossing in the summer of 1958/59.

The most important range in Western Antarctica is undoubtedly the Sentinel Range, at 77°-78° 30' south and 86° west, which since its discovery during the

Transantarctic flight of Lincoln Ellsworth in 1935 was sighted for the first time from the ground and surveyed in the course of the Byrd Land crossing in 1957/58. Of its 70 peaks, 30 rise to above 10,000 ft. and five above 13,000 ft.; the shapes are high-alpine with gigantic rock walls and sharp arêtes. The highest peak in the Sentinel Range is, at 15,334 ft., one of the first claimants to the fame of being the highest mountain in Antarctica. But in Southern Victoria Land there are several peaks exceeding 14,800 ft., of which only a few have yet been surveyed. But at the present state of exploration in Antarctica, the prospects of having "overlooked" a fivethousander (5000 m. = *c.* 16,400 ft.) are in any case not very great. A few nunataks in the Sentinels consisted of quartzite and phyllite; here, too, traces were found of an ice level at least 1000 ft. higher.

In the southern part of Grahamland, called "Ellsworth Highland", numerous peaks rise to altitudes exceeding 10,000 ft. from the high plateau of the inland ice which is mostly 6500 ft. up. Apart from Ellsworth's flight, we owe our knowledge about them to the survey work of the eastern group of Byrd's third expedition, which in 1941 discovered Mount Andrew Jackson, 13,800 ft., at 71° 30' south and 63° 30' west. In particular, however, the Ronne Antarctic Research Expedition 1947/48 has helped to diminish our ignorance of this region, not least because during the extensive reconnaissance flights numerous landings were carried out for more exact geographical position finding. Mount Coman (74° south, 65° west; 11,975 ft.) and Mount Rex (75° south, 77° west; 10,500 ft.) are the highest peaks until we get to the Sentinels. Attempts to climb these mountains have apparently not yet been undertaken.

North of 69° south Grahamland becomes a very narrow mountainous peninsula with a complicated coast line, off which, particularly on the west, there are also numerous mountainous islands. Deep fjords, steep rock walls, fissured glaciers and sharp peaks of more than 6500 ft. characterize this region, which on account of its relatively easy accessibility may be the first to gain importance for the mountaineer. Because of the numerous Argentine, British and Chilean stations, which have been here for years, one can already speak of the beginnings of colonization. By an exact mapping of this topographically difficult region, the very active Falkland Islands Dependencies Survey has done a great deal to further the opening up of Grahamland. Undoubtedly, many mountains were climbed in the course of this work; first of all Mount Français (9060 ft.), the highest summit on Anvers Island, on November 28th, 1955, by W.J.Hindson, A.J.Rennie and A.L.Shewry. The "Falkland Islands and Dependencies Aerial Survey Expedition 1955-57" climbed Mount Pond (1890 ft.) and Mount Kirk-

wood on Deception Island in January 1956. Even a Helicopter-landing was performed on the top of Mount Pond on February 6th. The highest mountain on Coronation Island in the South Orkneys (about 61° south), Mount Nivea (4180 ft.), was climbed on September 11th, 1956, by W.L.N. Tickell and A. Grant. During November of the same year, P.R. Hooper and G.J. Bull repeated the ascent of Mount Français. On the mainland of Grahamland an important ascent was made of Mount Johnston (7580 ft.) from Detroit Plateau in January 1957, by M.B. Bayly, D.G. Evans, L. Harris and A.L. Shewry. Farther south, Castle Peak (8260 ft.) was climbed in October, 1957, from Avery Plateau (about 67° south).

Mountaineering Conditions in Antarctica

The conditions which the mountaineer meets in the Antarctic summer (November to February) on the main mass of the continent can be compared, as far as temperatures are concerned, with midwinter in the European Alps. A very considerable difference, however, is the far greater frequency and force of the wind, particularly on the high plateau and in the marginal zones. The absence of days without any wind is quite characteristic of the Antarctic climate. The thereby increased rate of cooling makes heavier equipment necessary. The snow is mostly dry and extremely fine-grained; because of the close packing, as a result of repeated shifting by the wind, the surface is hard and mostly eroded into grotesque shapes, the Sastrugi. One only rarely encounters soft snow in even distribution; the soft snow, for the most part, fills the space between the hard Sastrugi only temporarily. As a result of these fluctuating conditions, skis can only be used exceptionally with pleasure, and crampons are mostly preferable. In connection with the ascent of Mount Midnight, W.G. Croll reported: "In one of the basins below the col Wood collected his ski, deposited there on the way up in the hope of a good run back to camp. He found though, as we generally discovered, that the wind-eroded surface was so rough, and changed so frequently from soft snow to hard firn and ice, that downhill runs are an extremely difficult and hazardous undertaking. He was pleased to arrive at camp, with only light falls, a few moments before the remainder of the party." As the hardness of the ice increases with falling temperatures, but the resistance of metals, chiefly to stress caused by shocks, decreases at the same time, crampon breakages are frequent. During the reconnaissance of the Ferrar Glacier by Hatherton, Smith and Gunn in January 1956, all eight pairs of crampons broke, and in the ascent of Mount Huggins Brooke met with the same mishap, necessitating a change in the plan of ascent.

Snow avalanches appear to be absent in the desert-like dry climate, or at least very rare. During flights over the horst range I could not find any signs of them, and the same was reported by F.R. Brooke, who has travelled almost 1250 miles across the mountains of Victoria Land. In February, 1947, Hawkes observed powder snow avalanches in the vicinity of Mount Markham, which are said to have been shaken off the steep flanks by the noise of the engines. F. Debenham, too, explicitly mentioned the absence of snow avalanches. In Amundsen's report avalanches on the Axel Heiberg Glacier are frequently mentioned: "We slept very restlessly as the roaring and rumbling kept on throughout the night, and one avalanche after the other crashed valleyward, uncovering patches on the mountains which since time immemorial had been covered by snow." These, however, were more likely to have been ice avalanches, as were also those observed during the ascent of Mount Huggins. B.M. Gunn writes: "The glacier we were on was little over a mile in width and enclosed by exceedingly steep ice walls from which we heard three avalanches fall in the night—the first we had heard in this usually quiet land." The eastern group of Byrd's third expedition in 1940 also reported experiences with ice avalanches on the ascent to the high Plateau of Graham Land. On the other hand, the danger from crevasses in Antarctica is very great, especially as even thin bridges frequently do not cave in and the appearance of the surface changes after every one of the many gales.

The arid dry valleys, where in mid-summer so much of the continuous sunshine is absorbed by the ice-free rock that locally a milder climate develops, are something apart. More difficult climbs without gloves and without heavy clothing are possible there, at least at times. This is also occasionally the case much higher up, at the edge of the inland ice. West of Mount Harmsworth Gunn speaks of "a most enjoyable climb on a small rock peak" (c. 5900 ft.), and further "the dolerite rock was solid and the ridge narrow with even a few vertical steps and the day warm enough to climb without gloves." J.C. Behrendt reported the same from the mountains of the Dufek Massif: "During the six days (December 9th to 14th) we spent in the area, the rock was warm enough to climb barehanded and snow was melting."

Mountains on the Antarctic Islands

Quite different are conditions on the islands situated within the Antarctic Convergence, which in places carry important mountains. South Georgia is of particular interest; here the whaling station of Grytviken (54° 16' south, 36° 30' west) has existed since 1904, and Heard Island (53° 01' south, 73° 23' east),

where the Australians maintained a station from 1947 to 1954. Here, in the region of the "brave westerly winds", a practically isothermal tundra climate prevails, at a latitude corresponding to about that of Hamburg.¹ A great part of the abundant precipitation of roughly 1,400 mm. falls throughout the year in the form of snow, the sky being almost continuously overcast,² and long periods of gales follow one another. Regardless of the relatively low latitude, the mountains on these islands are strongly glaciated, but because of the continuously unfavourable weather they are only rarely to be seen. Gales, fog and heavy masses of snow characterize conditions here for the mountaineer.

South Georgia has long been known as a seal-hunting and whaling base. During the first International Polar Year 1882/83 a German station existed at the Moltkehafen in Royal Bay, and in May 1902 Duse, Skottsberg and Andrew, members of Nordenskjöld's Antarctic expedition, ascended the Mount Duse (1624 ft.) in Cumberland Bay, in the course of geological and cartographical work. Most expeditions into the region of the Weddell Sea or Grahamland had visited the island, but the strongly glaciated and abrupt high range in the interior was still completely unknown, when Shackleton, after his adventurous boat journey, landed on the south-west coast in May 1916. On May 19th and 20th the island was crossed for the first time by Shackleton, Worsley and Crean; it was a bold and somewhat desperate undertaking, on the success of which depended the rescue of the men left behind on Elephant Island. Burdened with this responsibility, Shackleton, before setting out into the mountains, said to Worsley, the captain of the sunken expedition ship: "I will never take another expedition, skipper." Sir Raymond Priestley, geologist of Shackleton's *Nimrod* expedition and of Scott's second expedition, certainly did not intend to belittle this human achievement when he remarked, "Shackleton, no mountaineer, dramatized the scramble across the South Georgia ranges overmuch". Six years later, on January 5th, 1922, Shackleton died on the outward journey to a new expedition aboard the *Quest* in Grytviken Harbour, and he is buried at Grytviken.

In 1928/29 L. Kohl-Larsen carried out cartographical work in the interior of the island. This work was systematically continued during several expeditions in 1951-57 by the private "South Georgia Survey" under the direction of Verner D. Carse. After the stubborn overcoming of many difficulties a fine map of the

¹ On Heard Island the mean temperature of the warmest month is $+ 3.3^{\circ}\text{C.}$, of the coldest month $- 1.1^{\circ}\text{C.}$, and of the whole year $+ 1.1^{\circ}\text{C.}$ For Hamburg the same figures are $+ 16.9^{\circ}\text{C.}$, $- 0.3^{\circ}\text{C.}$ and $+ 8.3^{\circ}\text{C.}$

² On Heard Island only 12 % of the possible sunshine is recorded.

island has at long last come into being, which permits us to overlook the topographically and geologically difficult conditions. During this work Mount Spaaman (6367 ft.), in the Allardyce Range, was climbed on October 20th, 1955, by Keith Warburton, Louis Baume and George Spenceley, and Mount Paterson (7205 ft.), in the Salvesen Range on February 14th, 1956, by K. Warburton, Stan Paterson, John Cunningham and Tom Price. In the summer of 1954/55 the "British South Georgia Expedition", a climbing group under the leadership of George Sutton, tried in vain to climb Mount Paget (9545 ft.), the highest mountain on the island. Two attempts miscarried because of difficult ice conditions and unfavourable weather. On January 30th, 1955, Ian M. Brooker and E. Clive Webb finally succeeded in climbing Mount Gregor (6171 ft.); thus, this the easiest accessible part of the Antarctic, too, offers attractive objectives for the glaciologist and the mountaineer.

Heard Island was discovered by a British sealer, Peter Kemp, on November 27th, 1833, and rediscovered by an American, John Heard, in 1853. Soon after it was inhabited by seal-hunters, who gave the dominating ice-clad volcano, which rises in the centre of the island to an altitude of 9005 ft., the name of Big Ben. The island was later visited briefly by the *Challenger* Expedition of 1874 and by the *Gauss* Expedition of 1902. On December 11th, 1947, the Australian National Antarctic Research Expedition established a station on Heard Island, which unfortunately was closed down again on March 5th, 1955. During this time the island was studied geologically, glaciologically and biologically, and once more surveyed. Mount Olsen (2080 ft.), on the Laurens Peninsula, which in spite of its low height is completely glaciated, was repeatedly climbed. The gigantic massif of Big Ben, capped by the volcanic cone of Mawson Peak, is only rarely visible, as on the average only one day in the month is a clear one. Four attempts to climb Big Ben were undertaken, which made lengthy preparatory marking of the route through the fissured glacier necessary. In 1948 an attempt by Jacka and Gilchrist on the Abbottsmitth Glacier failed, as did one undertaken in 1949 on the Schmidt Glacier by Ealey, Chittleborough and Paddick. In 1951 Brown, Dingle and Lied reached an altitude of 3000 ft., whereas the fourth and (at present the last) attempt was the most successful. John Béchervaise, P. J. R. Shaw and F. W. Elliot managed in 1953 to reach an altitude of 5500 ft. before they were completely snowed up in a gale lasting six days. As in the end it seemed hopeless to wait for fair weather and provisions were running short, the return had to be started in continuing bad weather and endangered by avalanches. After eighteen days the group was back at the station and only after

a further twenty days did the mountain show itself, brilliant in new snow and hoar frost: "Big Ben's nine-thousand-foot dome seems then to float in the sky above the horizoned murk, making one of the most dramatic sights of the stormy southern ocean."

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THE COMMONWEALTH TRANS-ANTARCTIC EXPEDITION 1955-1958

By George Lowe

One tenth of the earth's surface is covered in ice: the greater part of this is concentrated on and around the Antarctic continent. And it was to study the surface, to measure the thickness and density, and to know more of what happened in the interior of this sterile continent that our expedition set out to make the first land crossing.

At first sight three summers and two winters on the southern continent would seem a long time to accomplish a journey lasting three months. The explanation lies in the difficulty of penetrating the ice which floats in masses around the continent and has only—up to the present—been breached in the late summer season, leaving little time to journey inland before the darkness and cold of winter make travelling too miserable to contemplate.

In November, 1955, *Theron*, a Canadian sealing vessel of 850 tons, sailed from London for the Weddell Sea coast of Antarctica, overloaded with stores and a party of sixteen men, led by Sir Vivian Fuchs, a geologist and explorer. After lazy days down the sea lanes of the Atlantic, *Theron* made her last port of call at the island of South Georgia. Although only sixty miles long, South Georgia has a mountainous backbone of icy peaks which stab into the sky, and active glaciers sweep down from the summits to poke their tongues into the sea. There are no trees growing on the island—which lies in the same latitude as Birmingham or Berlin—only a tough, golden snow grass and some emerald green mosses which sprout in the cold bogs. The peaks are sheathed in ice and the greater number, including the highest (Mount Paget, 9625 ft., and Sugarloaf, 8600 ft.) have so far proved inaccessible to the few parties who have attempted the ascents.

From South Georgia, *Theron* sailed off Mercator's projection and tried to penetrate the pack ice which drifts capriciously over the Weddell Sea. A few miles before crossing the Antarctic circle the ship, under the direction of her erstwhile captain, was involved in a battle with enormous fields of pack ice. As a climber who has a predilection for ice climbing I was fascinated by this new

form of sport. The captain, using the small ship like a great axe, lunged and twisted through the silent, slow-moving acres of ice. As we smashed through the thickest fields an east wind pressed the pack firmly together and gripped our ship. When the pressure eased we managed with dynamite and pick-axes to break the ship free, only to be gripped again and again. A month was spent fighting and drifting with the ice, until we broke out to make landfall on the continent at latitude 78° south—as far south as it is possible to sail by sea. 900 miles further south lay the Pole.

Antarctica is large—about the same area as Europe and the United States of America together; and it is a high continent—mostly over 8000 ft. and much of it 10,000 ft. above sea level. From the Weddell Sea we approached an unknown shore and planned to explore inland a completely new route to the South Pole. On a fringe of solid sea ice a foothold was established: a month later than was planned. During the unloading, storms assailed us, ripping the ship from her anchors in the ice. At the end of a week the sea began to freeze. To avoid being frozen in and crushed by barging icebergs, *Theron* sailed, leaving eight men to consolidate the insecure grip that had been made on the inhospitable shore.

During the hectic week of unloading the stores an inland flight was made with a small aircraft and this revealed some information of the "Hinterland". The base—which we named Shackleton—was established on a flat shelf of ice which, although 1500 ft. thick, one hundred miles wide and another hundred miles inland where it joined the rising land, was afloat and rose and fell between eight and sixteen feet with the tide. From the air the ice shelf could be seen to undulate gently as it reached inland. One hundred miles from the base the ice rose abruptly over land, where a range of mountains burst through the ice to rise in a steep escarpment. These were first seen from the air on the early reconnaissance and were named the "Theron Mountains". Later, on a visit to the range in the next year, the sedimentary layers of rock were found to sandwich thick seams of anthracite coal which contained fossil remains of tropical leaves over 3 ft. in length. The rock though steep and loose was a nesting place for snow petrels: a small, white bird which did not seem to be handicapped by the long flight out to sea to fetch food for its young. From the easy, gentle summits of the Theron Mountains it was possible to see a further range of peaks many miles inland but investigation of this was to wait for more than a year.

After eight days of almost non-stop unloading, *Theron* sailed hurriedly, leaving a party of eight men to build a hut and place their stores two miles inland away from the thin ice edge. Storms delayed the building and filled the working site

with tons of drifting snow. And storms broke up the sea ice on which the stores lay, sweeping all of the coal and spare fuel into the sea. The winter of four months' darkness was endured without heating, the party sleeping in pyramid-shaped tents which were frequently shifted to keep them on the surface.

A year later a second voyage, in *Magga Dan*, 1800 tons, a new and heavier vessel, returned to Shackleton to bring the party number up to sixteen.

An intensive programme of inland exploration began with long ranging flights. We again visited the Theron Mountains and the main points were climbed in the course of geological survey. Although the southern cliffs were steep there was little difficulty in avoiding them. Sixty miles beyond the Therons rose a second, more massive and more extensive range of mountains which we named the 'Shackleton Range'. Although this was more than 200 miles long and 40 miles in width, the summits were gentle and all of similar height as though this was an old plain which had been eroded away. Geological and topographical journeys were made with dog teams and the range was found to contain huge cliffs of conglomerate rock pressed together like fruit in a Christmas pudding. The peaks were about 5000 ft. above sea level and 1000 or 1300 ft. of rock stood out from the ice. I climbed some of these peaks and found them to be comfortable scrambles over easy rock. The temperature was never above 0° Fahrenheit and the rocks did not seem ever to become iced as the snow never melted. The snow crystals were normally angular needles typical of low temperature snow, and were easily blown about. In high winds these crystals acted like abrasive sand, with considerable weathering effect on the mountains.

Further south and beyond the Shackleton Range lay a third (and it proved to be the last) rocky obstacle across our path. This range was buried with just the black summits jutting through the ice cover. Beautiful and remote though these peaks were, they were typical of the mountains in this part of the Antarctic: gentle hills of dolorite left bare by the ice which flooded round them—mere islands in an ocean of ice, and the ice dominated them. They were not peaks of contrast, stature and storm. They shrank from ostentation and were meek and dull. Beyond the last range the ice sheet extended to the horizon, 600 miles to the South Pole.

300 miles inland from our well-equipped base on the Weddell Sea coast we established a small hut in which three people passed the second winter. This manned depot we called "South Ice". Living in this hut (16 ft. x 16 ft.) buried under drift, 5000 ft. above sea level, they emerged to make meteorological and glaciological observations. The volume of snow on the move was calculated

and measurements of temperature, density and grain size of the layers was carried out in a pit which was dug to a depth of 150 ft. On the surface during the darkness of winter the average temperature was around -38° Fahrenheit, with a mean wind speed of thirty knots.

With a knowledge of the topography and the obstacles to be overcome the party settled down at Shackleton. The second winter passed in preparing equipment for the land journey to be attempted in the summer of 1957-1958.

On the far side of the continent in a well-established base—Scott Base—a similar party settled for the winter after an active season exploring the mountains of the Pacific sea-board. The other half of the expedition, which had approached the continent from New Zealand and was led by Sir Edmund Hillary, reviewed their situation. Their base huts were established on the bare scoria slopes of Ross Island. Above them rose the active volcano of Erebus, 13,300 ft. In contrast to us they were surrounded by views of mountain and sea. The peaks in sight rose abruptly in alpine ridges and cliffs to delectable summits of around 1400 ft.—Mount Lister, 13,288 ft., which is still unclimbed, was the grandest face of all.

During the two summers of activity the New Zealand party climbed some forty named and unnamed peaks between 3000 and 12,000 ft. in height. Mount Gauss (8000 ft.) was one of the first to be climbed. This point stood up above a narrow steep-sided valley in an area of grey granite. In this range of mountains, running north and south along the coast of Victoria Land, many “dry valleys” were seen and explored. These arid, rocky valleys curiously lacked glaciers and permanent ice and were swept by frequent winds. Mount Harmsworth (9121 ft.) was climbed by a party of three, who manhailed their supplies on fibre glass sledges up the broad and easy Skelton Glacier. The 7000 ft. climb was made in crampons up crevassed ridges and shoulders to the summit, which was used as a survey station, the climb in continuous daylight taking twenty-four hours. In the Britannia Range two peaks—Mount Longhurst (9200 ft.) and Mount Henderson (9120 ft.)—were climbed; again in the course of survey work.

But undoubtedly the finest mountain ascended and the most difficult climb accomplished was that of Mount Huggins (12,860 ft.) by B. Gunn and F. Brooke on January 27th, 1958. This pair approached Mount Huggins at the end of a 1000-mile sledge journey with dogs, during which they climbed twenty-nine peaks. The summit was a tempting target for the climbers—and a useful one too, for photographs from its summit were the only record of the elusive watersheds that had baffled their completion of a map. By January 24th the two men had examined the mountain from Stepside Spur and then established a

camp on the north side. Leaving their dog teams they carried a light camp to the Trench Glacier and from there climbed on rock, taking eight hours on the final ascent and thirteen hours on the return journey to camp.

The highest peak in the range and one of the most inaccessible is Mount Markham, measured by theodolite and reported over forty-five years ago as being over 15,000 ft. This was seen from close quarters by Dr. Marsh and J.H. Miller from a point 10,500 ft. above a col on the Markham Range. This mountain may well prove to be the highest peak of the continent: for although reports from pilots have been made claiming peaks up to 20,000 ft., none of these claims has been substantiated.

The third summer on the continent was almost wholly occupied by the making of the land journeys; Sir Edmund Hillary leading a party up through the mountains of Victoria Land to a gap in the peaks at 8000 ft., from where he made a 1200-mile journey across the high plateau to the South Pole, arriving on January 4th, 1958.

I went with Sir Vivian Fuchs' party, composed of twelve men—seven scientists, two engineers, a doctor, a radio operator and a photographer-mountaineer (the last-named rôle was mine). On November 24th, 1957, we left Shackleton driving nine over-snow vehicles and two dog teams. Only four vehicles (all "snow-cats") were to reach the far side of the continent. Each vehicle used petrol at the rate of one mile to the gallon. To cross we used five vehicles as travelling petrol stations and discarded them when their load was consumed.

The first 350 miles to South Ice occupied the first month of our journey, and progress on most of these days was desperately slow and worrying, over miles of ice seamed with hidden crevasses. On the second day, only 25 miles from the coast, the leading vehicle burst the lid of a deep crevasse 15 ft. wide. The vehicle did not fall but plunged in and buried itself nose first in the far wall of ice. Recovery of these fallen or jammed vehicles was a long and skilled manoeuvre, but our engineers always accomplished it.

I had been amongst crevasses before but these were different: they were wider, deeper and harder to detect. Over many miles we pounded the way ahead of the vehicles, walking on skis, with long poles probing the ice suspiciously. Whenever a crevasse was found an inspection hole was made in the lid. Sometimes we dropped down through the hole on a rope, but mostly we peered from the surface to gauge the width apart of the supporting walls. If the gap were more than 3 ft. we probed again and marked the narrower gaps with flags.

During the weeks to come we were to experience a score of these incidents. Anything from five to twenty hours of preparation were needed before the actual

shifting of the trapped vehicle could begin; but when this stage was reached the vehicle was hauled to safety in as many seconds.

Our journey around the first two mountain ranges and across the intervening glaciers was full of incident during which we experienced fear, frustration, boredom and excitement. The last, almost buried mountain range we crossed near its highest point and drove out on to the polar plateau. The crevassed areas lay behind and the next 600 miles to the South Pole, although not devoid of incident, were easier. We reached this most southerly point on earth on January 20th, 1958. The United States had established a scientific base on the site over 9000 ft. above sea level. We were treated with wonderful hospitality: the South Pole does not receive a lot of visitors and the occasion was celebrated adequately.

We now had over 1200 miles to complete the crossing in a month before the winter set in; but we had the enormous advantage of travelling a known and marked route. We could still see the tracks made by Sir Edmund Hillary's tractors etched in bas relief by the wind, leading us on like railway lines.

Still making daily readings of the ice depth (by seismic sounding) we plunged on to find Hillary's depots spaced along the last 700 miles. With Hillary as our guide we crossed the glorious mountain peaks on the Pacific coast and drove down a winding glacier which descended from 8000 ft. to sea level in 60 miles.

The sun was setting at night and the cold winds increasing and the temperature falling below -40° Fahrenheit when we reached our journey's end. We arrived at Scott Base on March 2nd, 1958, after a journey lasting ninety-nine days.

The journey across the narrowest part of the Continent made by our team of twelve (in addition four flew over) came at the beginning of a new surge of interest in the Antarctic. Australia, Belgium, Britain, New Zealand, South Africa, the United States and Russia are still actively exploring: the Americans and Russians have made some remarkable journeys since.

Our expedition was not an integral part of the great organisation of the International Geophysical Year, but where possible we co-operated with the larger plan. We were essentially a travelling party whereas the I.G.Y. bases were static observation posts recording information on previously agreed fields of investigation. The seismic traverse which enabled us to draw a profile of the buried continent was, I think, our most valuable contribution. Along the line of our journey the land beneath the ice proved to be above sea level except for two points which fell below. At the South Pole, 8000 ft. of ice lies over land 1000 ft. above sea level: but only 25 miles from the Pole our records showed 1500 ft. of ice over land 7500 ft. above sea level. Papers on the "Geophysical

Investigations of the Commonwealth Trans-Antarctic Expedition" are printed in "The Geographical Journal" of the Royal Geographical Society, London—Volume CXXV, Parts 3-4, 1959.

Although we used vehicles we still clung to camping and eating rules of the past. The great advances made by mountaineering experience we did not generally use: polar explorers are very cautious of trusting new developments. Even so our progress of twenty miles a day was comfortable when compared with the first of these journeys made fifty years ago. Then, Amundsen with his dogs or Scott on foot walked the 1800 desperate miles. Amundsen averaged 17 miles a day with his dog teams and returned according to plan; Scott averaged a dozen miles a day and died tragically within a hundred miles of his base.

Since our journey from the Weddell Sea to the South Pole the Russians have completed a journey from another quarter, arriving with a massive train of warmed caravans. This is the trend, and in the future there will be no place for the lightly-equipped hardy dash which was the spirit in which our expedition was conceived.

SPRING IN THE ARCTIC MOUNTAINS

By F. H. Schwarzenbach

I am attempting here a report on the botanical experiences in the Canadian arctic of the 1953 Expedition of the Arctic Institute of North America and the Swiss Foundation for Alpine Research to the Penny Highlands of Baffinland. There is no question of providing a scientific account; instead I will restrict myself to selecting certain details which will give some interesting glimpses into the strange flora of the arctic mountains.

The arctic mountain spring had come. The weather observer was still reading continuous temperatures of several degrees below freezing point near our camp at 3350 ft., although by the calendar it was already June 9th. But among the rocks the dry stone felt warm, and only one inch from the ground the thermometer rose to over 50° F. Already the sun was above the horizon for 23 hours a day, and in ten days we would be able to film the midnight sun on the ice-cap.

In the small ravine the icicles dripped; like tears, the heavy drops fell from the ice-beards several feet high and splashed with monotonous regularity upon the moist and glistening black stones. Water collected on the ice of the small pool beyond the moraine, to the great joy of the cook, who could at last dispense with melting the snow pan by pan before each meal. The first stones shot down the face of the mountains and whistled over projecting rocks, until at last they were silently swallowed up by the deep snow. The narrow, slightly sloping belt of scree which ran along the foot of the rock face was free from snow. The strawy tufts of the sedges and grasses, dirty and of greyish-yellow hue, still clung to the ground; here an ear from the previous year was still enclosed in ice, as if it had been set in glass; there the strong withered stem of an arctic pink (*Melandrium affine*) leaned against an ice fragment which had slid down; on a shoot the length of one's finger was the cup of an empty seed capsule, the ribs of which projected like very slender bones.

But beside these bruised and tattered objects that had survived the winter stirred the first harbingers of the arctic spring. At the extreme edge of the scree belt the first blooms of cinquefoil (*Potentilla hyparctica*) unfolded its golden-

yellowish flower-leaves; the blossom was deeply imbedded in the rosette of young leaves, as if cowering from the cold. The little red-tinted corolla had hardly outgrown the budding stage; the edges of the leaves were still folded inwards and wrapped in soft hairs as if in a coat.

A few yards further up the knotty little trunk of an arctic willow (*Salix arctica*) was rooted in a rock fissure. The short, curiously twisted and many-branched twigs hugged the ground closely; drift sand and small stones deposited by the water had been caught in the confusion of the branches. A few dead and bare shoots stood up; they had fallen victim to a fierce autumn frost which had killed all those parts of the plants which still protruded from the thin snow cover. Who would have believed that this espalier willow was already 27 years old? Only with the magnifying glass could the annual rings on the cross-section of the thumb-thick little trunk be counted; the closeness of these rings testified to the small annual growth of the tree. The arctic summer is short; little more than two months are available for these plants to grow in this habitat, for as early as mid-August night frost sets in again, and in September the first autumn gales roar through the land.

But now, in the first days of spring, the earliest willows put forth their catkins. On some of the plants was the male inflorescence, egg-shaped and with silvery-white hairs; on the other willows the cone-like female catkins stood up from the branch like candles. Strange how the arctic willow flowers at different times: some set their catkins immediately after the snow has melted; others hold development back, while the last ones dawdle around the whole summer so that their blossoms are caught by the first frost. In some mysterious way each espalier receives the order for setting its blossoms at a time special to itself, quite in contrast to most other arctic plants, where the setting of blossoms begins at the same time for all, so that within a few days an entire valley floor is transformed into a sea of blossom.

Near the espalier willow another early flowerer of the arctic mountains is found, the saxifrage (*Saxifraga oppositifolia*), which occurs not only in the arctic but also in the Alps. With its tough, wiry roots the plant had anchored itself in a fissure, hanging freely down a boulder for half a yard and finally branching out to a dense espalier of little quadrilateral columns, each barely half an inch long, which were formed by thickened scaly little leaves facing each other in pairs. The pairs of leaves followed each other crosswise and were conspicuous by the close arrangement of the individual little columns. The violet flowers bloomed singly at the ends of these shoots; their vivid colour contrasted conspicuously with the greyish-green, often blackish-brown foliage.

The saxifrage is one of the least demanding plants of the arctic mountains. A handful of sand in a fissure is sufficient for it to take root. Among the close ramifications of their espaliers sand and fine earth collect, allowing the seeds of other species to develop. On limestone this species of saxifrage climbs up to the vegetation limit; on primeval rock it occurs less frequently, but even on that unfavourable ground it reaches to remarkable altitudes. On the west side of the upper Highway Glacier, on the ascent to our camp on the ice-shield, this saxifrage still flowered at an altitude of 4300 ft. above sea-level. The site lay at the foot of the last rock face in the transitional area to the icecap of the Penny Highlands and was truly the last outpost of the mountain flora at the edge of the ice desert.

Determining the food of the lemmings

After the snow had melted the number of lemmings in the "Snow-Owl-Valley" had increased rapidly. Undoubtedly, we were at the beginning of a lemming year, during which these rodents increase enormously in number. The lemmings ran daily into the traps which we had put up around the tent; our zoologist had caught lemmings by hand by diving at them; and one day an inquisitive animal had crept into my trouser pocket when, leaning against a boulder, I was drawing a plant in my field-book.

Our zoologist wanted to know what these rodents really fed on. Since he had ascertained that only one of the two lemming species occurring in Baffinland was affected by this sudden increase, his interest in this question was further stimulated. He wondered whether there was any difference in feeding habits between the two species. A week ago he had brought me the contents of a lemming's stomach for microscopic examination; unfortunately, I was unable to help him, as the leaves and stems had been reduced to a green mass and scarcely anything was any longer intact.

Later, he brought me a freshly killed lemming, which the male snow-owl had laid beside its eyrie. The lemming must have been taken by surprise when looking for food, for a minute piece of a grass-stem still projected from its mouth. Our zoologist carefully opened the animal's jaw with a pencil and with tweezers removed this stem as well as two leaf-fragments, a few square millimetres in size, to a small collecting glass. The next evening he presented me with further food specimens, all of them taken from the mouths of lemmings which the snow-owl had caught and carried to his eyrie.

There was now a modest spoil of finely chewed food fragments, leaf shreds and

pieces of stem. Lying on my stomach, I peered into the microscope, which stood rather shakily on the tundra soil; yet, being connected with an old battery, it had the luxury of built-in lighting. A small leaf fragment from my food collection lay on the slide, little enough if one is to determine the food plant on this evidence. Still, the task did not seem quite hopeless: parallel veins suggested a grass; three hairs at the edge of the leaf provided further clues; size and distribution of the fissures could perhaps be of importance.

Examinations of the remaining finds brought new details to light: seven of the nine pieces obviously came from the same species of grass. On one piece the width of the blade could be measured. Because of its lighter colouring and its smaller cells a zone of growth could be given to one fragment; one piece of stem had been bitten through at the joint. These clues were sufficient for a classification, but it took hours before, by comparing the fragments with grasses growing in the vicinity, it was possible to give a clear answer. The result was curious enough. The lemmings seemed to be real connoisseurs with a particular weakness for the tender parts of leaves and stems that are still in growth of the holy-grass (*Hierochloa alpina*) which smells so strongly of hay.

It was somewhat easier to identify the last two pieces, which apparently belonged together. They were also a grass, and this food plant could definitely be described as the arctic meadow-grass (*Poa arctica*), which occurs in great quantities on the dwarfshrub tundra and in the swamps at the foot of the valley slope. Again it was remarkable how the lemmings had shown particular preference in gnawing off the still tender and slightly sweetish parts of the young leaves and stems. Later in the year the lemmings became less demanding. Their numbers had by then increased to such an extent that food shortage did not allow any extravagance. The tundra was eaten bare over wide stretches, and in places the turfy top layer of the swamps had been undermined and broken up by the numerous lemming runs; withered clumps of sedges and grasses, denuded of roots and stems, lay folded over like hard clods in the ditches of the humped tundra.

One puzzle remained: what happened in the autumn after the mass increase of these animals? Had they obeyed an overpowering migration instinct and moved off in a crowded procession, irresistibly pressing forward in spite of all obstacles, as we know to be the case from observation in Scandinavia? Had mass death from hunger exterminated the animals apart from a small remainder? Had some plague destroyed the legions of grey rodents? An answer to these questions is hardly likely to be found.

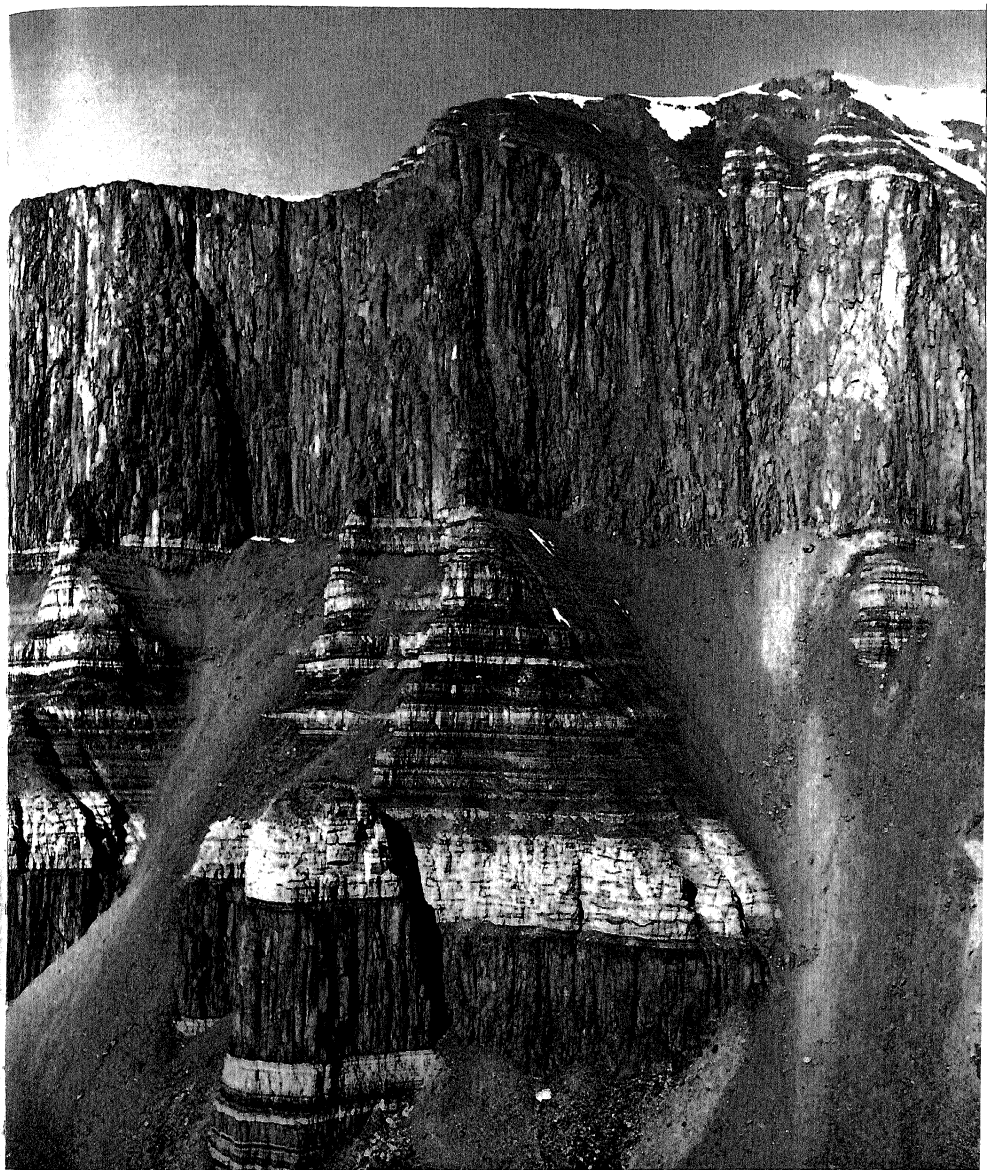
The "Hedgehog Desert"

Heavily loaded with supplies for three weeks, we had crossed the ice of Glacier Lake on our summer skis, and, slithering rather than skiing, had reached the mile-long terraces of the "Snow-Owl-Valley" through a narrow ravine which was filled with numerous snow-cones. The snow was foul, and a slight drizzle fell from the low-hanging clouds. Trousers and anoraks were sodden and our hoods stuck to our hair. Our woollen gloves were soaked. The skis were of no great use on the plain. We tied them across our sacks, taking care to fasten our loads so that the melted water from the snow which stuck to them would not run into our sleeping bags. We trudged over wind-swept humps and terrace-ledges down the valley, avoiding the snow-filled hollows as far as possible. Now and then a horn-lark or a Lapland longspur shot up from the dumps of reed-grass, which were as yet only partly free from snow, the only incidents during our monotonous march.

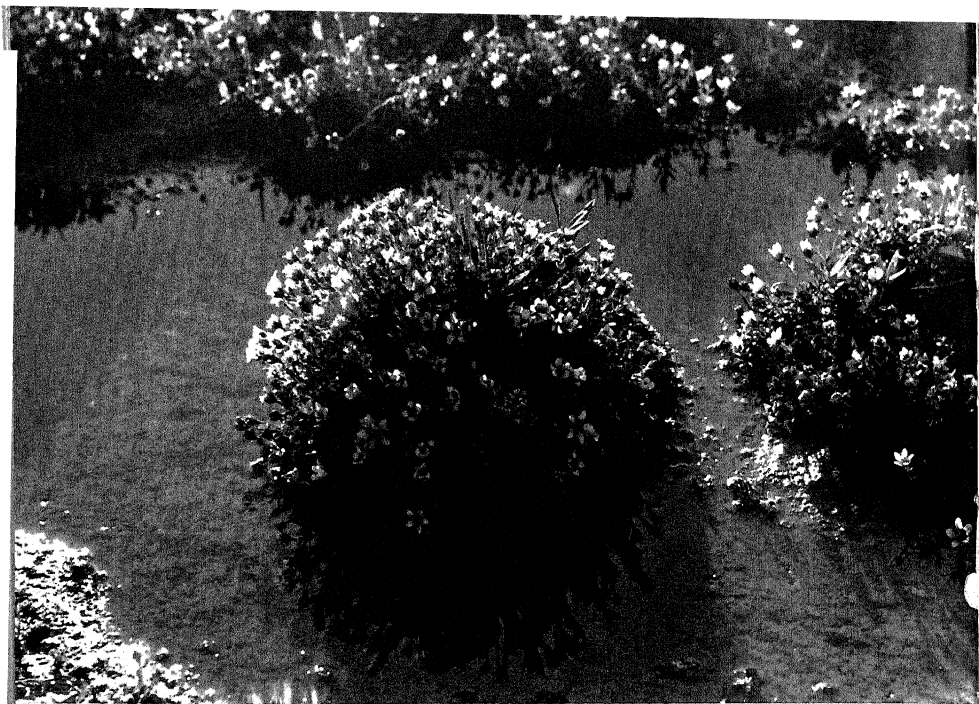
We had been four hours on our way; our rucksacks weighed us down and our conversation had gradually ceased. Slowly we climbed up a hill and crossed the flat ridge, when a strange sight presented itself. From the sand on the slope before us arose hundreds of small and large heads with curious manes and straw-coloured tufts, as if the survivors of some prehistoric race of hedgehogs had lain down there to rest. Half-buried in the sand there were little hedgehogs the size of a fist, and beside them were dignified heads, with bleaching and tousled manes, that rose up so high that when, grateful to be able to rest for a quarter of an hour we made ourselves comfortable on these stools, our feet dangled in the air.

At first the "Hedgehog Desert" stuck to our minds as a strange phenomenon; a week later we returned to the spot in order to explore the secret of these hedgehogs.

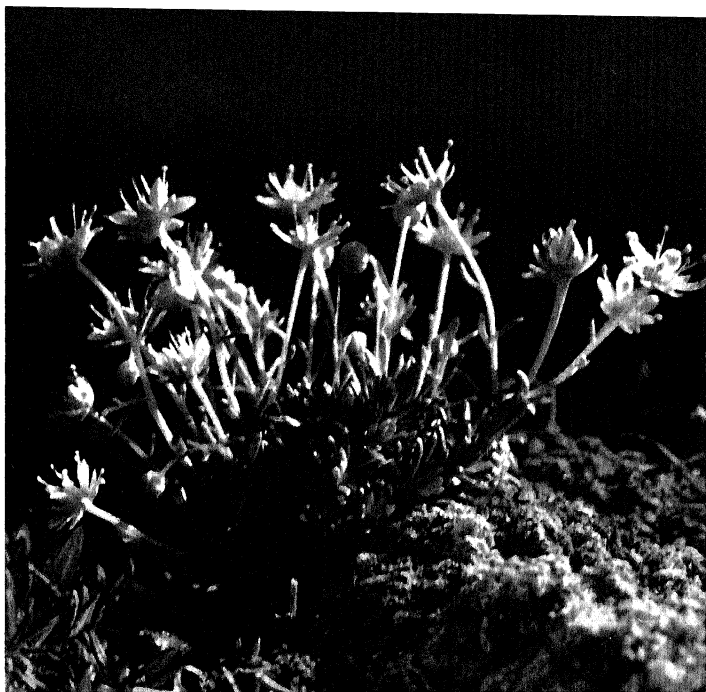
At the cost of some hard labour, with our axes we opened up one of the largest heads, but the entire hedgehog consisted only of thread-like, closely interwoven roots penetrating a huge bale of sand and rich humus, anchoring the head firmly to the sandy soil by means of a neck-like connection. The tuft consisted of pale-brown leaves, crowded together into a thick clump. Tousled dry foliage from earlier years enclosed the well-preserved leaves of the previous summer, and right in the heart of the clump were hidden the yellow-green shoots which only four weeks later were to shoot up as strong stiff stems with black-brown ears, so that we were able at long last to classify the plants as a species of arctic sedge. Smaller heads were in part made up of other plants. Hedgehogs as big as cabbages contained branches of the American white dryas (*Dryas integrifolia*); on the



60 THERON MOUNTAINS in Coats Land, about 150 miles south-east of Shackleton-Base, seen from the air. The escarpment is about 2000 ft. high and consists of horizontal layers of sandstone with coal seams in the lower layers, permeated by vertical strata of Dolerite. (Aerial photograph by Commonwealth Trans-Antarctic Expedition, January 1957)

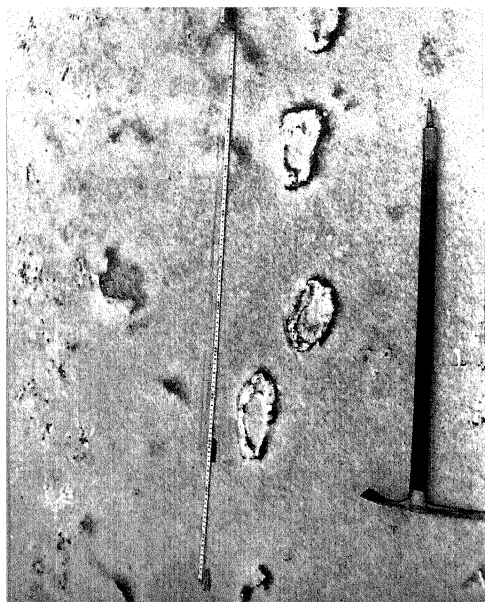


61 left, top: SAXIFRAGE (*Saxifraga nathorstii*). Yellow, flesh-coloured or violet bushes of arctic saxifrage species appear on small islands wherever a river forms a shallow delta of innumerable rivulets.
 bottom: ARCTIC WILLOW (*Salix arctica*) in bloom. Female catkins looking like bottle-cleaners, protruding from clusters of leaves which grow very close to the ground. (Photographs by F.H. Schwarzenbach)



62 upper right: YELLOW SAXIFRAGE (*Saxifraga aizoides*). The fleshy leaves resist the drying influence of the wind.
 bottom: ARCTIC RHODODENDRON (*Rhododendron lapponicum*) in bloom. Violet blossoms herald the advent of spring in the arctic Tundra. (Photographs by F.H. Schwarzenbach)





63 top left: TRACKS OF A YOUNG ANIMAL on a frozen moraine-lake in the Khumbu, Nepal-Himalaya. (Photograph by Ed. Wyss-Dunant)
bottom left: FOOTPRINT showing in sharp relief on snow overlying a glacier in the Menlung basin of Nepal-Himalaya. (Photograph by Eric Shipton)

63 top right: ASCENDING TRACKS with imprints of toes, Khumbu, Nepal-Himalaya. They had partly become indistinct and reduced in size as a result of a snow-storm.
bottom right: TRACKS ON FROZEN SNOW, Khumbu, Nepal-Himalaya. (Photographs by Ed. Wyss-Dunant)

smallest of them lay cushions of the stemless fly-bane (*Silene acaulis*) or the sea thrift (*Armeria maritima*).

We were puzzled for a long while by the origin of these strange heads, until, right at the edge of the "Hedgehog Desert", we came to a spot where the entire process was revealed stage by stage. At the beginning of the whole process was a continuous meadow, showing that hummocked surface so characteristic of high-arctic conditions, as if a newly dug garden bed had been sown with grass before the clods had been broken-up. A tributary of the main river had once watered this meadow, but a change in the water course had cut off the water supply as time went on, and the uppermost layers of the soil had dried out, while the violent valley-wind had blown away the sand wherever there was a breach. In midsummer the sand plumes were visible from afar as they swept in the gale over the plant cover, tearing fresh wounds into the plant carpet like a sandblasting machine. Wherever a clump succumbed in the battle against sand and wind, a gap opened up which could no longer be closed. The wind bored away ceaselessly, until in the end only those heads were left where wind-resisting plants, deeply rooted in the soil, retained the sand in their roots. But even the largest hedgehogs were not immune from the onslaught of the wind; the wind gnaws and tunnels at their foundations until the whole head has been detached from the ground. Once cut off from the groundwater, the plant withers quickly; its firm hold on the grains of sand loosens, leaves and roots decay, until the clump is completely destroyed. This destruction of the hedgehogs continues irresistibly; they may survive for years, perhaps decades, until the last hedgehogs fall to pieces; but the day will come when, in place of the former flourishing meadow, a desolate area of sand will stretch along the valley stream like a wound.

Plant propagation

For two hours I had climbed leisurely over boulders and scree up the southwest ridge of the mountain, which, as a distinct corner buttress, forces the tongue of the Highway Glacier to change its course. Already the sun hung low in the west. The altimeter showed over 3300 ft. The highest patches of grass were already behind me, although now and then, in a fissure, in a protected niche, or on a ledge, one of those unassuming plants could be found which we describe as rock pioneers. Here the bloom of a white-flowered saxifrage (*Saxifraga caespitosa*) looked out of the thick rosettes, while there a clump of the high-arctic meadow-grass (*Poa arctica*) or the dwarf-like little pods of whitlow grass

(*Draba nivalis*) squeezed itself into a fissure. The wind whistled over the ridge in strong gusts, the low sun was unpleasantly dazzling even with snow-glasses. The ridge became more exposed and short rock-climbs interrupted the monotonous ascent. I had seized a high hold with my left hand in order to pull myself up over a step, when my eyes fell upon the small flying seed of fleabane (*Erigeron eriocephalus*), which had been caught on my woollen glove. Only then did I observe the many cotton-wool flakes which were driven up by the up-wind, flashing like sparks in the glaring counterlight, and thrown over the ridge in a whirling dance. All these flying seeds sailed past in gay sequence, the seeds of willows alternating with the feathery balls of the white dryas, occasionally followed by a seed of fleabane or the willow herb (*Epilobium latifolium*); occasionally the parachute of a dandelion (*Taraxacum hyparcticum*) sailed past. The wind carries the seeds over wide distances. Sometimes they are left lying on the ground for a while, clinging to a projection or resting on a shelf until a new gust of the wind catches them and the game continues. The seeds glide over the firmly frozen wind-crust of a névé field together with the plumes of snow; they drive along in whirling squalls with wind and leaves, close above the surface of the great valleys, until they are cast at last into some corner sheltered from the wind. Perhaps the seed germinates and grows into a plant; but more likely it fails to find favourable conditions and it dies.

Not all plants make use of the wind to transport their seeds; their seeds are too large and heavy and have no flying equipment. With others propagation takes place through off-shoots, through shoot buds or through bulbils from the axils of the foliage. With all these species the wind plays only a subordinate part in propagation. With certain species melt water may tear away offsets, or at times whole plants, and wash them ashore again further down. More frequent, however, is propagation by animals. If, in the autumn, the lemming collects hundreds and hundreds of grass and reed-grass stems in the vicinity of his burrow in order to build his winter quarters, many a seed gets lost on the way; if, in the spring, the redpoll or the Canadian pipit searches for material for her nest, the seeds, still clinging to the withered stems, are carried along and unloaded later on. Many birds feed on seeds and parts of plants. The snow-grouse shows a partiality for the shoots of knot-grass (*Polygonum viviparum*) and for the bulbils of a saxifrage (*Saxifraga cernua*). In late summer whole flights of snow-grouse follow the habitats of these two species, pecking the red shoot buds from the axils of the plants, until their crops are full, thus contributing to propagation. The snow bunting, which advances as far as the snow line, feeds indiscriminately

on the leaves and seeds of Arctic plants. In so doing, it may often carry grass seeds and berries away and deposit them at distant places.

With the help of wind and water, lemmings and birds the plants migrate. Nature repeatedly finds a way of spreading the species, even if it takes years and decades, until some rock spur, laid bare by the receding ice, has been colonized again by plants.

THE YETI: BIPED OR QUADRUPED?

By Edouard Wyss-Dunant

It was a radiant day, the first day of the spring that was rising to attack the hard winter that still lay in the Khumbu Basin (May 4th, 1952).

The rays of the sun fell obliquely and a light mist gave an unreal, fairy-like touch to the landscape. A lark was singing its welcome to the spring, up here at 5000 m., and a solitary fly settled on my hand.

I had come down from the upper camps to our abandoned Base Camp to seize certain provisions which had disappeared from Camp I and which were doubtless intended for a return journey *incognito*, when I saw coming up in my direction the strange outline of a creature which to me seemed monstrous. From the shelter of a rock, whence the view plunged into the Lobuje Valley, I watched the movements of this solitary being, whose figure stood out from a crest against the luminous but misty background.

The chest seemed excessively big and the bent arms had an non-human length. He progressed along a grassy crest, as if searching for something on the ground. I felt a little uneasy because I had no weapon with me. At these altitudes, where one can only move slowly, and running is a physical impossibility because of one's breathing and one's heart, it is better to keep at a distance when anything threatening approaches. Nevertheless, the sight was disturbing.

I continued to watch the movements of the creature as he came on. I could not distinguish the face, which was in shadow, but the aspect was disquieting. Was it the figure of a man? By the shape of his barrel-like chest and his long arms he was much more like something simian.

The creature left the crest and went down towards the valley before taking to the grassy slope. And to my great surprise I saw him suddenly following the track which our column had made in passing. I watched his movements closely.

His walk had become less ponderous. His arms, which I had seen bent and long, took human form and the bloated thorax vanished. The anxiety which had gripped me vanished as the reality became clear: this was not a yeti approaching the Base Camp, but a man. Thus I realised the optical illusion which a trick of

light and mist can create, giving rise to fantasy and legend, an experience which Prof. Pronin had probably had in the Pamirs in 1958, when he said he had seen simian creatures fleeing at his appearance. I might go so far as to say that, if I had not allowed this man to come close, and if, after the fashion of the natives, I had fled in order to escape an evil fate at the hands of the yeti, I would have given the same assurance as Pronin, or the botanist Tombazi (1925) or Henri Elmes (1906), that I had seen a yeti, the monstrous biped that haunts the Himalayas. I would probably have done so with even more assurance, since some days earlier we had come upon tracks which no human being could have made before our passage. Snow still covered the Lobuje Valley as well as the Khumbu moraines. The advance party had left on April 18th in a thick fog to fix the site of the Base Camp. The party returned without realising that it had put to flight some mysterious creatures who were at the edge of a little moraine lake where our Base Camp was to be pitched.

Some days later the whole column was there. It was then that I first discovered some small tracks in the deep snow which I confused with Lambert's tracks, which are recognisable from a great distance. For, following the loss of his toes by frostbite, he had trained himself to wearing short boots. But on this little frozen lake we found the same tracks and our comrade Lambert had certainly not been looking for a foot bath! But a little lower down, towards the lateral valley, imprints of much greater size stretched for a great distance. They were just like tracks which might have been left by well-guided climbers, following a well-ordered marching technique, except near the little lake, where the troop, taking a rest, had broken up. The little one had been for a walk on the frozen surface of the lake just as any other child would have done. Its tracks were in bad condition, because they had been swept by the wind. But the imprints revealed by the crushed snow were frozen and remained there in relief. They measured 20 cm. long by 12 wide; that is to say, the same size as a human footprint. The others in the valley were much greater in length and width. I assumed these three were adults. Their length was from 25 to 30 cm. and their width 15 cm., measurements which corresponded more or less to the dimensions taken by Shipton on Menlung Tse. The stride was 35 cm. long and the movement was straightforward and not zigzag.

The tracks were not in good condition, for snow had fallen during the night of April 18th to 19th; but it had been driven by a strong wind which uncovered the imprints enough to reveal the details. The toes were visible; on two imprints I was able to distinguish three clearly marked claws, the big and little toes being

without them, while behind the footprints of the two adults I could see the imprint of a disjointed W like two fingers or two spurs. This was probably the mark of a fetlock, if a tuft of bristles on the leg above the heel could be so called. Doubtless this was the same mark of which Frank Smythe had said that the heel was provided with two toes turned backwards; this peculiarity could be the origin of the legend of the backward-turned foot.

This adult track led me to an obstacle, a great erratic rock. How had the beast crossed the obstacle? Had he crossed it on two feet or on all fours?

The animal had in fact leapt over it, landing on four feet, the fourth marking the first pace. It made a second leap over a further rock, beyond which I found a repetition of the three imprints, followed by the fourth which marked the first pace. Thus I was concerned with plantigrade quadrupeds and in all probability with alpine bears with a regular march. For further on three paths converged, one coming from the moraine, the other two from the valley, joining and continuing as if a single individual had passed, a fact which has always disturbed the natives and contributed to the greater strength of the legend.

I was thus able to distinguish four individual creatures: two adults showed the largest tracks and the triangle behind the heel; one track revealed a younger creature without the same signs of maturity, and a fourth was the track of a cub.

At the moment of flight when our reconnaissance columns arrived, the whole family rushed down the slope of the marginal moraine of the Khumbu Glacier. At one point one of these animals let himself slide backwards, loosening clumps of silenus and earth. He braked with all the strength of the two rear big toes in a position of strong abduction. The mark in the mud was deep and I could find no claw mark in it. This might have been worn out, for it seemed improbable that the big toe would be altogether without one. There was another special characteristic besides the abduction of the big toe: the lengthening of the second toe while the other three toes were scarcely marked. The tracks were lost among the rocks; I found them again, tangled up on the Khumbu Glacier, and followed them as far as possible towards the middle of the glacier, where they vanished because the ice was so hard. Perching myself on a sérac I looked all around without seeing a thing. Were they perhaps in a crevasse or behind a block of ice? I wandered about even further, but was still faced with the same answer: they had crossed the glacier to the other bank on the way towards the heights dominating the Imja Khola and had chosen the easiest passage, which they must have known well, since they had fled in a panic, judging from these disordered tracks.

Returning to the neighbourhood of the lake, I began to search for the remains of meals, excrement or possibly a lair.

If I had had Ralph Izzard's luck (*Daily Mail Expedition*, 1954), I would doubtless have discovered like him some faecal matter of carnivores containing the fur of rodents, large tailless rats related to the rabbit, which abound in this region (the natives call them "abra"), as well as vegetable matter. It would still have been necessary to avoid any confusion with remains left by eagles and the gypaetus or even by panthers, whose tracks crossed those of the plantigrades. It seemed that this place was much frequented by the local fauna, to judge by the traces they left.

My searches were fruitless, but a little further off the panther, driven from its hiding place by our approach, gave a prodigious bound and vanished.

Thus I was faced with the absence of any signs of a prolonged stay and I was certainly left with the impression that the bears were only passing by, like nomads that stay on high places away from the only creature they dread, man, coming down at night to scan the valleys where they find their food. They have a strong sense of direction and know the passes, glaciers and mountain massifs around which they make their way according to a certain cycle which is laid down for them by the seasons.

What kind of bear was it?

P.E. Pocock has mentioned *Ursus arctos isabellinus* which is only a variety of the very common brown bear. But we preferred to think that this must be a more distinct species of the high mountain region. Probably *Selenarctos tibetanus*, to which Dr. E. Schaefer, a tibetologist from Hamburg, drew attention in 1935. This explorer's experiences in search of the yeti in Eastern Tibet are known.

With the help of baksheesh, he was able to get some of the reticent natives of the Wata tribe to lead him to the yeti's lair, though they kept at a respectful distance while waiting to see what happened. The explorer found there, not a biped yeti, but a sleeping bear, which was the *Selenarctos*.

During his three expeditions to Tibet, Dr. Schaefer had the opportunity to see bears walking upright; it was obviously a very impressive sight. One has to have been in these immense landscapes to understand how closely an upright bear resembles a monstrous human form. Personal experience is necessary, too, to grasp the effect this sight can produce on natives imbued with demoniacal tales, terrifying stories handed down from father to son. All their demonology prepares them for such sights, as much by the pictures as by the information. This is the land where the adage, *Primum in orbe deus fecit timor*, proves true.

The release of immense and often inexplicable forces creates anxiety. In order to protect himself from them man creates the myth, as much to satisfy his understanding as to arouse his defences. And, after the fashion of children, he gives to the disturbing object a magical force which it uses to protect itself. Thus, none can look upon a yeti without bringing an evil fate upon himself. It is therefore understandable that descriptions of the yeti given by natives can differ so much that one is unable to draw any useful conclusion from them.

One Sherpa produced a very humorous reply to my questions. It was Pansi, our cook:

"You go along to the Zoological Garden in Calcutta", he said. "You'll find the real yeti there."

Humorous? Perhaps. But probably, too, the conviction that the yeti is an animal.

After all the expeditions that have gone off in search of the yeti, without having found it, one can accept Pansi's sally and put the fabulous creature among the myths.

The three expeditions of Tom Slick and F. Kirk Johnson (1957/58/59) brought back no new discovery, except tracks and the radiograph of the mummified hand at the monastery of Thangboche. This has been examined at the Anthropological Institute of San Antonio (Texas). It is a human hand. Ralph Izzard had already mentioned this hand in 1954, as well as the famous Khumjung scalp which is 18 cm. deep and 66 cm. in circumference and covered with reddish hair, stretching over the sides of a crest 2.5 cm. deep and running from the brow to the occiput.

This is, finally, the only relic which we are unable so far to place, a very slender hope for the mythomaniacs of the yeti. Three Soviet expeditions, superiorly equipped, went in recent years to the Central Pamir following upon the statements of Prof. Pronin that he had seen two yeti in flight. Neither Prof. Porchev in 1958, nor Prof. Stanjukevitch were able to confirm Pronin's information. Stanjukevitch concluded that there was not the slightest reason still to believe in the existence of a primate. All the more reason why one should class the "Abominable Snowman" among the variations of the millenary legend of Gulbiyavan, the spirit of the desert. Yeti, Meti, Kang-Mi, Mi-Gö—all these names embrace the same myth with local variations. Meanwhile, Dr. W. Tchernezky of Queen Mary College has made a study, published in *Nature* (May 7th, 1960). His conclusion is in favour of an imposing and massive primate related to the *Gigantopithecus fossilis*. He made a plaster reconstruction of the yeti's foot

based upon Shipton's photograph on Menlung Tse. The imprint made by the plaster model is in most details very like the original track in which one can see very clearly the powerful thumb in abduction, the lengthening of the second toe, with the other three toes little differentiated functionally, characteristics which we noticed in our bear tracks. There is one characteristic that is different: the absence of claws. As to the heel, it is also very like the bear heels that we have examined. The author has decided that this is a primate's foot with an opposable big toe. We find it rather difficult to share his view.

For a primate with an opposable big toe, one would expect, as in the case of the gorilla, a thenar prominence capable of operating the flexor muscles and bringing the big toe into opposition. This eminence should have a corresponding swelling on the plaster or make a deep impression in the snow. It is scarcely shown either in the print or on the plaster. The bend between the big and the second toes is no more pronounced than that of the bear. Finally, a primate would need a heel not so large and longer metatarsals, which would truly permit this foot-hand to climb trees as the author suggests.

But supposing that, despite these reservations, it is nevertheless a biped's foot: it ought then at least to be equipped for the indispensable tibio-tarsus functions of rotation in abduction or adduction.

Now it seems that this movement might be very restricted, to judge by the tracks photographed up till now. As far as I know, it has not been possible to demonstrate that the yeti can turn the point of his foot outwards or inwards without displacing his heel at the same time. Thus it is very improbable that we are dealing with a biped, and if it is necessary to refuse him this foot for charitable reasons, we can on the contrary grant it whole-heartedly to a quadruped, to the bear in particular, with whom the characteristics we have pointed out constitute a successful functional adaptation.

Movement on precipitous terrain, especially on steep slopes, requires the help of the inner edge of the foot. We have seen on the moraine the deep imprint of the big toe and of the second toe of the bear; that is to say, he has effected a successful differentiation of these organs. By separating, the thumb puts on the brakes and the greater bearing surface of the second toe assures stability. This procedure deprives the other three toes of any active function, which leaves them undeveloped but adequate for walking on the level.

Finally, the biological conditions of alimentation and of geographical zoology make the stay of a primate in the high altitudes of the Himalayas impossible. The severe climatic conditions, with frosts and storms, require effective means of

protection. The bear, thanks to his thick fur, can withstand the great cold and, thanks especially to his great reserves of fat, can undertake long marches after the manner of his cousin, the polar bear. The latter carries out a cycle of several thousands of kilometers, on the Greenland barrier ice first of all, where it can feed abundantly until the ice breaks up. It then goes back to *terra firma* and on the fringe of the inland ice undertakes the ascent of the whole east coast (1000 to 1200 km.) without food until he can get to the barrier ice again. For this migration he has an extraordinary sense of direction in the glacial valleys. He moves by preference while it is cold, by night or in stormy weather, doubtless in order to benefit from the bearing snow. When the temperature is too mild he takes shelter in a crevasse, where he waits for darkness before continuing his journey. The polar bear is armed by nature to struggle against cold and hunger: he is armed both physically and morally. His Himalayan cousin is obedient to analogous conditions. For him, instead of the barrier ice are the valleys that he scours one after the other while following a high level route which he knows perfectly.

A primate nomad would have to be equally well armed by nature to be able to stand up to the severe frustrations of all kinds to which he would be exposed. One would find shelters and remains other than naked tracks left by creatures whose economy leaves them complete autonomy for a definite period.

Conclusions

The yeti footprints are zoomorphic and not anthropomorphic. The claw-marks prove this, and if the footprints on Menlung Tse are without them, this is perhaps because the soft snow had covered them up again or because the snow had melted. These are doubtless the very conditions which were the cause of the fact that on only two footprints—the best—did we find claw-marks (even of three claws), unless it be that the claws do not necessarily leave a print, because they do not always touch the surface. The conformation of this bear's foot, as described, should be regarded as a phenomenon of functional adaptation. It is found in man for various reasons, and is a fortunate adaptation when a latent function becomes active, as is the case, for example, when the adductive function of the big toe becomes mobile and prehensive among numerous peoples who walk barefooted. The toes spread out and each conserves its function. Or it is an unhappy adaptation in those pathological cases of defective stability, where a change of conformation is compensatory.

To conclude, the question is, which bear is this? Is it *Selenarctos tibetanus*, which often moves on two feet, or some other unknown species?

We think that the moment has come to attack the real problem and no longer seek at any cost to justify a myth. But there will doubtless be fewer followers for a zoological expedition than for one that searches for a mythical creature to the full accompaniment of the Press.

THE MAP OF MOUNT MCKINLEY

The new large-scale map of Mount McKinley represents the culmination of a dream, which I have had for many years, to apply the superb methods of Swiss cartography to one of the great mountains of Alaska. This map represents the work of seven different trips and expeditions to, up or over Mount McKinley between 1945 and 1960. Although my observations, aerial photography and the editing of this sheet have been my personal extracurricular activity for fifteen years, a great many other individuals and organizations have contributed generously and effectively to make its compilation and publication possible.

The initial funds for this project came from my own lecturing. Then came two generous gifts from the late Dr. Alexander Hamilton Rice of New York, the director of *Harvard's Institute of Geographical Exploration*. Finally, *Boston's Museum of Science*, the *Swiss Foundation for Alpine Research* and the *American Academy of Arts and Sciences* joined forces financially to make publication in 1960 possible.

This is a "reconnaissance" map when viewed from the critical engineering standpoint. Its altitudes are probably all correct within a dozen feet. Its horizontal positions vary as to accuracy, from a maximum of real precision in the case of certain key peaks like Mounts McKinley and Brooks, to a minimum along the southern edge of the sheet where the control is less closely distributed and not so strong mathematically. The time and cost involved in carrying out a more precise survey of this extremely rugged southern sector would have postponed publication for at least three more years, and there is serious doubt whether the expense (even if funds could have been secured) would have been justified, in view of the wild nature of the terrain and the minor changes which might have resulted from a huge amount of additional field work.

The map in its final form represents a job of extremely high precision contouring, cliff drawing and shadowing just as if the control were first-order geodetic work throughout. In this way, we have produced a sheet which depicts with a very high order of accuracy the shapes and relationships of the complex

land-forms involved. The magnificent job of preparation of the final manuscript and printing would have been utterly impossible had it not been for the whole-hearted and patient collaboration of many of the world's top cartographers at the *Swiss Federal Institute of Topography* in Bern-Wabern.

The vertical photography was carried out from B-29's and B-47's of the *United States Air Force* in 1947, 1951 and 1955 at altitudes from 35,000 to 40,000 ft. I took several hundred oblique photographs in 1936, 1937, 1938, 1947, 1949, 1953 and 1959 which were extensively used in interpretation of the details of the terrain for cliff-drawing and shadow representation.

Assistance in the field work was given, in particular, by my wife Barbara, the first woman to climb Mount McKinley, James E. Gale, William D. Hackett, G. Robert Lange, Norman Bright, Chauncey W. Waldron, Jr., Edward A. Ames, Jr., David R. Fisher and Richard T. Kleber.

Numerous airplane landings on skis and air drops were effected by the Alaskan Air Command, United States Air Force, Hakon Christensen, Terris Moore and Don Sheldon. Helicopter landings at several of the lower survey stations were carried out in 1949, 1953 and 1959 by pilots William Weed, William Kummer, Harold Stephenson and Oscar Yznaga. The Chrysler Corporation made available one of its wonderful Plymouth station wagons to facilitate the complex transportation of our party within McKinley Park during the summer of 1953.

The Topographic Division of the *United States Geological Survey* in Denver, Colorado, prepared the many glass diapositive plates needed for the stereo-contouring, as well as large-scale copies of the manuscripts of their maps of the region immediately to the north of this new map. Robert O. Davis and Thomas V. Cummins were specially helpful in this office.

The *United States Coast and Geodetic Survey* contributed heavily and constantly in advice, counsel and computations throughout the full 15-years duration of this project. Their 1924 triangulation network along the route of the Alaska Railroad fixed the stations from which we tied in our control to the south of McKinley. Their field parties of 1952 and 1953, under the leadership of Commander Howard S. Cole, established the chain of first-order triangulation stations in the lowlands north of the Alaska Range from which the final checking of our northern control was done. They also collaborated with us in the precise determination of the position and altitude of the two peaks of Mount McKinley and Mount Brooks. In particular, the following U.S.C. & G.S. headquarters personnel gave generously of their time in addition to the many members of

Commander Cole's field party: Rear Admirals L. O. Colbert, R. F. A. Studds and H. Arnold Karo, Captain Albert J. Hoskinson and Messrs. C. A. Whitten and Gordon Littlepage.

Throughout the project, the *National Park Service* has given the most cordial assistance through the three different superintendents at Mount McKinley National Park during this long period of time: Frank T. Been, Grant H. Pearson and Duane C. Jacobs. Grant Pearson was also a member of our 1947 expedition.

The creation of the map itself in Switzerland has taken three years of the most painstaking and precise work arranged through the enthusiastic co-operation and unflagging enthusiasm of Karl Weber, Ernst Feuz and the late Othmar Gurtner, all of the *Swiss Foundation for Alpine Research*; First, in 1957, a small 6,5 x 6,4 sample was completed and published in *The Mountain World* and *Berge der Welt*. In 1958, final compilation started. Stereo-plotting was carried out on a great A-8 Autograph at Wild-Heerbrugg by Messrs. Othmar Wey, Siegfried Malchow, Walter Müller and Jakob Denzler.

The cartographic artwork and printing were done at the Wabern headquarters of the *Swiss Federal Institute of Topography* under the direction of Mr. Ernst Huber, who succeeded Prof. Bertschmann in 1958 as director of the Institute, and Dr. Daniel Chervet, with whom I have been in almost weekly communication on details for more than two years. Paul Ulmer and his staff depicted the intricate rocks and moraines, while Paul Witzler personally and alone did the equally complex shadow-drawing—on both the 1957 test sample and the final sheet. Both of these men are the world's foremost experts in their fields and, from the start, it was my hope and Othmar Gurtner's that they would undertake this task for us.

No words can ever adequately express my gratitude for what all these many friends and collaborators have done to make this dream of mine at last come true. But, above all others, I owe the greatest debt of thanks to the *Swiss Foundation for Alpine Research*: to Karl Weber, Ernst Feuz and Othmar Gurtner, without whose friendship and generosity, wisdom and understanding this unique co-operation between Switzerland and the United States could never have taken place.

Bradford Washburn

Director of the Museum of Science, Boston, U.S.A.

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